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ASTRAGALUS IN ARGENTINA, BOLIVIA AND CHILE

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Continued from p. 374

39. *Astragalus Monteroi*, sp. nov.

Herba prostrata; caulibus 2–4 dm. longis 1–2 mm. crassis sparse inconspicueque strigosis sparse longeque ramosis foliosis, internodiis 3–5 cm. longis; foliis superioribus paulo reductis; rhachibus foliorum 3–5 cm. longis sparse strigosis partibus basalibus efoliatis 0–15 mm. longis; stipulis chartaceis ocreatis 2.5–5 mm. longis, lobis 1–2.5 mm. longis; foliolis 6–9 jugatis carnosulis obcordatis vel oblongo-obcordatis supra medium vel medium versus latioribus apice retusis basi acutis supra glabris subtus glabratis vel praesertim in margine et costa strigosis costatis sed enervatis 5–14 mm. longis 4–7 mm. latis 0.5–1 mm. longe petiolulatis; pedunculis 3–6 cm. longis cum floribus 8–20 congestis terminatis; calycibus 4–5 mm. longis sparsissime strigosis tubo 2–2.5 mm. longo lobis 1–2 mm. longis angustis pedicello 1–2 mm. longo; vexillo 9–10 mm. longo 8 mm. lato apice retuso 1–2 mm. longe unguiculato medio albo et caeruleo-striato alibi caeruleo; alis flavescentibus quam carina 1 cm. longa ultra medium caerulea 2–2.5 mm. brevioribus; ovario glaberrimo; leguminibus glabris pendulis congestis 11–14 mm. longis oblongis acuminatis supra acutis subtus planis 3–4 mm. crassis, a latere viso supra leviter concavis et subtus valde concavis.

CHILE. Cautin: Puerto Saavedra, 3 m. alt., Feb. 30, 1932, *G. Montero* 1161 (type, Gray Herb.); Llaima, Jan. 1925, *Claude Joseph* 3118 (US); Budi, Feb. 1928, *Claude Joseph* 4878 (US).

In gross habit and in corolla structure the present species much suggests the coarse forms of *A. palenae* (i.e. the var. *grandiflora* Speng.). The fruit of *A. Monteroi*, however, is very different from that of *A. palenae* and very much more like that found in *A. amatus* of the coast of central Chile. The closest relative of *A. Monteroi* is evidently *A. amatus*. From this species it is quickly distinguished by its glabrous ovary and fruit. It is a coarser and much larger plant with much larger more fleshy leaves. The species seems to be very well marked.

40. *Astragalus amatus* Clos in Gay, Fl. Chile 2: 115 (1846).—Type given as from Porfiro, on road from La Serena to Arqueros, 1433 m. alt., *Gay 269*.
Astragalus procumbens Hooker & Arnott, Bot. Beechey Voy. 18 (1830), and Bot. Misc. 3: 186 (1832); Hooker, Bot. Mag. 60: t. 3263 (1835); Reiche, Anal. Univ. Chile 97: 540 (1897), and Fl. Chile 2: 83 (1898).—Not Miller (1768).—Given as collected by *Lay and Collie* at "Conception," Chile.
Phaca tricolor Clos in Gay, Fl. Chile 2: 105 (1846).—Based upon collections (devoid of geographical data) said to have come from the coast of Coquimbo and Aconcagua.
Astragalus tricolor (Clos) Reiche, Anal. Univ. Chile 97: 550 (1897), and Fl. Chile 2: 93 (1898). Not Bunge (1868–69).
Astragalus ferrugineus Clos in Gay, Fl. Chile 2: 114 (1846); Weddell, Chlor. Andina 2: 262 (1861); Reiche, Anal. Univ. Chile 97: 567 (1897), and Fl. Chile 2: 110 (1898).—Based upon material (mixed and probably mislabeled) given as from near Cauquenes, *Gay 237*.
Astragalus leucomallus Philippi, Linnaea 30: 186 (1859).—Based upon material from coast near Topocalma, prov. Colchagua, *Gay 527* and *Volckmann*.
Phaca brachyptera Philippi, Linnaea 33: 44 (1864).—Type collected near Catemu, prov. Aconcagua, *Philippi*.
Astragalus brachypterus (Phil.) Reiche, Anal. Univ. Chile 97: 541 (1897), and Fl. Chile 2: 84 (1898).—Not Fischer (1853).
Astragalus litoreus Philippi, Linnaea 33: 46 (1864); Reiche, Anal. Univ. Chile 97: 540 (1897), and Fl. Chile 2: 83 (1898).—Type collected on the coast near Coronel, 1861, *F. Philippi*.
Tragacantha brevislata Kuntze, Rev. Gen. 2: 940 (1891).—A new name based upon *P. brachyptera* Phil. (1864); *A. brachyptera* Reiche (1897), not Fischer (1853).
Astragalus chilensis Sheldon, Minnesota Bot. Studies 1: 157 (1894).—A new name based upon *A. procumbens* H. & A. (1830), not Miller (1768).
Astragalus subandinus Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 264 (1902).—A new name based upon *P. brachyptera* Phil.; *A. brachypterus* Reiche (1897), not Fischer (1853).

RANGE: West-central Chile, from the province of Concepcion north to the province of Coquimbo, along the ocean and east into the coastal mountains.

CHILE. Coquimbo: hills of decomposed basanite near Porfiro, road between La Serena and Arqueros, 1433 m. alt., *Gay 269* (Paris, type of *A. amatus*); Coquimbo, *Cuming 881* (K); Andocollo, Oct. 1926, *Claude Joseph 4533* (US); Est. Fray Jorge, 215 m. alt., *Skottsberg 786* (Stock, Gottenburg); Fray Jorge, 1935, *Muñoz 137* and *165* (G); Punta del Viento, Fray Jorge, 400 m. alt., 1925, *Werdermann 916* (G, BD); Cuesta de Cavilolén, ca. 30 km. s. w. of Illapel, steep banks, standard blue-purple, wings white, 500 m. alt., *Worth & Morrison 16465* (G). Aconcagua: Zapallar, Sept. 17, 1917, *Johow* (G); Cerro de la Cruz, Zapallar, *Behn* (Behn); Punta de Quintero, cliffs, *Poeppig 189/307* (BM, BD); Quintero, *Werdermann 1* (G, BD); mountains [above Catemu] *Philippi* (BD, isotype of *P. brachyptera*); Concon, *Poeppig 190/257* and *188/211* (BD, Paris); Playa de Concon, sand, 1937, *Jaffuel & Pirion 3946* (G); Viña del Mar, dunes, 1830, *Bertero 1824* (G, NY, BD, Paris); Valle de Marga Marga, 40 km. inland, 250 m. alt., 1929, *Jaffuel 247* and *3021* (G); Las Zorras, 1917, *Skottsberg 1038* (Stock, Gottenburg); Playa Ancha, 1829, *Bertero 823* (Paris); hillside, Queb. Jaime, Valpo., Nov. 1895, *Brenning 129* (BD); El Alto, hillside, 1830, *Bertero 1821* (G, Paris); Laguna Verde, 1930, *Garaventa 2122* and *2129* (G). Santiago: San Antonio, dunes, Sept. 1829, *Gay 469* (Paris). Colchagua: Matanzas, March 1894, *Philippi* (G, LP); near stream, Cauquenes, Feb. 1831, *Gay 237* (Paris, type of *A. ferrugineus*). Talca: Llico, Dec. 1861, *ex Philippi* (LP); Iloca, Feb. 1931, *Fuentes* (G). Concepcion: Coronel, sea-shore, Feb. 1861, *F. Philippi* (G, isotype of *A. litoreus*); Coronel, *ex Philippi* as *A. litoreus* (BD); Talcahuano, Dec. 1861, *herb. Reed* (K); Quiriquina, Nov. 1924,

Claude Joseph 2855 (US); San Miguel, Nov. 1933, Barros 137 (G); Concepcion, Cuming 137 (K); Concepcion, Sept. 1895, Neger (BD); prov. Concepcion, ex Philippi as *A. litoreus* (Boiss, Stock); San Vicente, Dec. 1894, Philippi (G). Indefinite: "Chile," Gay sine no. and Gay 584 (Paris, type of *P. tricolor*); "Chile," Gay as *P. tricolor* (G, K, BD).

Assembled here under the name *A. amatus* is a very variable group of plants of western Chile, found from the provinces of Concepcion to Coquimbo, and characterized by having the wings of the corolla conspicuously shorter than the keel. The group of forms is very readily recognizable and has a close relative only in *A. Monteroi* of the coast of southern Chile. Possibly it may be a complex of local species. The material available to me, however, is inadequate for an attempted analysis of it at this time.

Certain of the phases of *A. amatus* deserve special comment. There is an erect plant of the coastal mountains, somewhat back from the ocean in the province of Aconcagua, which has small ovate or oblong leaflets which are markedly and gradually diminished in size upwardly along each leaf-rhachis. Its corollas appear to be a darker blue than in the forms from other regions. This plant is typical *A. amatus* and is that described as *P. brachyptera* by Philippi. I have seen collections of it from Porfiro, Andacollo and Catemu.

The other forms of *A. amatus*, sensu lat., are decumbent or prostrate and appear to grow near the ocean or in the coastal hills under more marked maritime influence. The most striking of these spreading forms is a white-tomentose plant with coarse stems and thickish broad ovate leaflets which appears to be restricted to sands and dunes along the ocean. This extreme form has been described as *A. leucomallus* Phil. Though very conspicuous in its extreme development the tomentose plant seems to intergrade with the common, excessively variable and more mesophytic forms of the fields and slopes back from the sea. These latter vary in coarseness of stems and in size and shape of the leaves. Their leaflets may be subcordate to linear or narrowly elliptic, appressed villous to nearly glabrous, 3–15 mm. long, 2–6 mm. broad, and their apices from obtuse to retuse. They present, accordingly, considerable variation in gross aspect. To this complex of forms belong the names, *A. procumbens* H. & A., *A. litoreus* Phil. and *A. tricolor* Clos, the first to the much collected form north and south of Valparaiso, the two latter names to the small-leaved glabrescent slender-stemmed laxly decumbent phase which prevails in the region about Concepcion.

The type of *A. procumbens* H. & A., which I could not find at Kew, is said to have been collected at Concepcion by Lay and Collie. It is said to have elliptic retuse leaflets which are "tomentoso-hirsutis" or "sericeo-villosus." I have seen no such plant from near Concepcion, where the glabrescent forms such as *A. tricolor* and *A. litoreus* seem to predominate or, at least, have been most collected. The original description of *A. procumbens* fits best the plants found on the slopes about Valparaiso.

The type of *A. amatus* Clos is a mixture of two very different forms. The label on the type collection (Gay 269) gives the source of the plants as Porfiro, 1000 m. alt., in the mountains northwest of Coquimbo. Of the two forms mixed under Gay 269, one is indistinguishable from the spreading densely white-tomentose plant of the coastal sands which Philippi later called *A. leucomallus*. The other plant, erect, cinereous and appressed villous (rather than tomentose) and bearing more numerous (9-15) smaller strongly truncate or retuse leaflets, is most like the type of *A. brachypterus* (Phil.) Reiche. This latter is the form which has the numerous leaflets noticeably reduced in size up each leaf-rhachis and the one known only away from the ocean in the coastal hills of Coquimbo and Aconcagua. In his discussion of *A. amatus* Clos distinguishes these two forms, mentioning first the erect plant of the interior and second the spreading white-tomentose plant of the coastal sands. In his description of the species, however, the tomentose dune-form seems to be somewhat emphasized. In this connection it may be noted that, at Paris, Clos has identified Bertero 1821 as "*A. amatus*." This particular collection by Bertero is the tomentose dune plant. Since, however, Clos identified other very similar collections of the white-tomentose dune-form as "*A. procumbens*," I cannot attach any importance to his identification of the collection of Bertero mentioned.

Not only are the collections of "*A. amatus*" mixed in the herbarium at Paris, but so are the duplicate collections of the species distributed to other herbaria. For example, at Berlin there are two sheets of "*A. amatus*," one is entirely the tomentose dune plant and the other is a mixture of *A. nudus* and *A. vesiculosus*. The sheet of "*A. amatus*" at New York is the tomentose dune plant. At the Gray Herbarium the sheet of "*A. amatus*" is a mixture of the erect plant of the interior (i.e., *A. brachypterus*) and *A. nudus*. Similar mixtures are found in other herbaria. It may be noted here that the material of the dune-form forming a part of the mixed type of *A. ferruginosus*, in appearance, discoloration, maturity, manner of preparation, etc., is so very much like that mixed in the type collection of *A. amatus*, that I am confident that they were collected and prepared at the same time and are parts of a single dissociated collection. This would mean that the material of this particular collection of the coastal dune-form was not only divorced from its proper label but was also separated and improperly associated with collections of other forms of *A. amatus* from different localities. There is plenty of evidence that some of Gay's collections did get mixed. In the present case of "*A. amatus*" it seems clear that the label on the type at Paris could apply only to the plant of the interior (i.e., *A. brachypterus*) collected at Porfiro, and that the material of the white-tomentose dune form must be extraneous. Hence, because in his publication Clos discussed the erect plant of the interior before mentioning the spreading plant of the dunes, and since there is every reason for believing that the plant of the interior, rather than the coastal dune form, will be found at

Porfiro, the locality given on the associated label, I believe that the erect plant of the interior should be accepted as the typical element in the complex type of *A. amatus*.

The type collection of *A. ferrugineus*, at Paris, is a mislabeled mixture. The type-sheet contains a plant of the tomentose dune form (i.e., *A. leucomallus*) and one of the slender glabrate forms similar to those found about Concepcion (i.e., *A. tricolor* and *A. litoreus*). These are obviously parts of two different collections made at different places. The label is, with the exception of the plant-name added by Clos, entirely written by Gay. It reads, "237, Provincia Colchagua, Astragalus ferrugineus Clos ad rivulos, Cauquenes, february 1831, fl. septembri, etc., frequens, t. basaltique, (Chili)." During February 1831 Gay was exploring along the Rio Cachopoal and visited Baños de Cauquenes and the Estancia de Cauquenes in the province of Colchagua. This area, at the base of the cordilleras, however, is far beyond the known range of the coastal *A. amatus* and its forms. They are not known, nor to be expected, east of the coastal mountains, within 100 km. of Estancia de Cauquenes. The material on the type-sheet, hence, represents parts of two different collections (probably from the dunes near Valparaiso and from the coast near Concepcion), which are improperly associated with the label belonging to an unknown third plant. Though Clos, in his description of *A. ferrugineus*, seems to be concerned only with the tomentose dune form, the type collection is so badly mixed that I believe the species had best be discarded as a nomen confusum.

The type material of *P. tricolor*, at Paris, consists of two sheets devoid of any precise geographical data. This type-material and the original description agree well with plants collected in the coastal area of the province of Concepcion. When *A. tricolor* was described, however, it was given as growing near the coast in the provinces of Coquimbo and Aconcagua. Among the many collections which I have seen from the coast of Aconcagua and Coquimbo none are similar to the original material of *A. tricolor*. I am confident that the type-material of *A. tricolor* really came from the region about Concepcion.

41. *Astragalus valparadisiensis* Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 264 (1902).—A renaming of *A. trifoliatus* Phil.

Astragalus trifoliatus Philippi, Linnaea 28: 681 (1857); Reiche, Anal. Univ. Chile 97: 543 (1897), and Fl. Chile 2: 86 (1898). Not Boiss. (1843).—Type originally said to be from the Andes of the province of Santiago. Reiche, however, gives it as from "Algarrobo," on the coast of Aconcagua.

CHILE. Aconcagua: Valparaiso, ex Philippi dedit. 1876, as *A. trifoliatus* (BD, Del); Valparaiso, no collector given, as *A. trifoliatus* (Speg.).

I know this plant only from descriptions and from the collections, all evidently duplicates of one gathering, above cited. It is a very distinctive plant with its trifoliate leaves, coarse loose stipular sheathes and very dense abundant long silky golden indument. It is to be noted that in the literature Philippi and Reiche differ as to the origin of this species, the

former giving it as from the cordilleras, the latter as from the coast near Valparaiso. The specimens distributed by Philippi, however, are labeled as from Valparaiso, and this is probably correct. The general habit of the plant suggests an inhabitant of dunes and a close examination of the specimens reveals the presence of clean white sand in the stipular sheathes and among the hairs of the indument. No fruit of the species is known. The original collection shows flowers at anthesis. These much suggest those of *A. nudus* and I suspect that is the closest relative of *A. valparadisiensis*.

42. *Astragalus cachinalensis* Philippi, Fl. Atac. 15 (1860); Reiche, Anal. Univ. Chile 97: 547 (1897), and Fl. Chile 2: 90 (1898); Johnston, Contr. Gray Herb. 85: 52 (1929).—Type collected at Cachinal de la Costa, *Philippi*.

RANGE: Fog-bathed hills and cliffs along the coast of prov. Antofagasta, northern Chile.

CHILE. Antofagasta: Cachinal de la Costa, *Philippi* as *A. cachinalensis* (BD, isotype); near Aguada Grande ("Cachinal de la Costa" of Philippi), 1925, *Johnston 5825* (G, US, K); near Aguada Cachina, 1925 *Johnston 5740* (G); El Rincon near Paposo, 1925, *Johnston 5497* (G, US); Aguada Panul, 1925, *Johnston 5431* (G); near Aguada Miguel Diaz, 1925, *Johnston 5349* (G, US).

A plant with slender elongate trailing leafy stems and very large flowers. The bluish standard becomes 12–18 mm. long. The keel is cream-colored and tipped with bluish. The petals become yellowish when dry. The species is a very distinct one and is restricted to the fog-bathed slopes along the southern half of the coast of the province of Antofagasta. It is obviously an isolated outlying relative of *A. amatus* of central Chile.

43. *Astragalus nudus* Clos in Gay, Fl. Chile 2: 115 (1846); Reiche, Anal. Univ. Chile 97: 546 (1897), and Fl. Chile 2: 89 (1898).—Based upon two collections, dunes near La Serena, *Gay 15*, and between La Serena and Arqueros, 1300 m. alt., *Gay 270*.

RANGE: Known only from the region about Coquimbo and along the coast in southern Atacama.

CHILE. Coquimbo: Rare, hills of decomposed basanite (near Porfiro), road between La Serena and Arqueros, 1300 m. alt., *Gay 270* (Paris, type); Herradura, 1917, *Skottsberg 1057* (Stock); scattered on dunes near ocean, La Serena, Sept. 1836, *Gay 15* (Paris); Isla Guacolda, Huasco, on sand of island, perennial, standard lavender and white, wings white, Oct. 26, 1938, *Worth & Morrison 16224* (G); Chile, *Gay* as *A. nudus* and *A. procumbens* (K); Chile, *Gay* as *A. amatus*, in pt. (BD); Chile, *Gay* as *A. procumbens* (G, NY).

The corolla of *A. nudus* dries yellowish except for the distal half of the keel which is purplish or blue. When fresh the standard is probably pale bluish and the wings cream-colored. The whole plant is densely strigose and canescent. The stems appear to be erect or ascending. The relationships of the species are with *A. valparadisiensis* and, particularly, with *A. Dodt*. I have not seen the completely mature fruit of this species.

44. *Astragalus Dodt* Philippi, Linnaea 33: 48 (1864), Anal. Univ. Chile 27: 343 (1865), and Anal. Univ. Chile 84: 28 (1893); Reiche, Anal. Univ. Chile 97: 545 (1897), and Fl. Chile 2: 88 (1898).—This species was based upon flowering plants from near Copiapo, *Dodt*, and upon fruiting plants from Arqueros, *Gay*.

Astragalus Rengifo Philippi, Anal. Univ. Chile 84: 25 (1893); Reiche, Anal. Univ. Chile 97: 544 (1897), and Fl. Chile 2: 87 (1898).—Based upon material collected near Chañarillo, Sept. 1876.

Astragalus melanogonatus Johnston, Contr. Gray Herb. 85: 52 (1929).—Type from Punta Reyes, prov. Antofagasta, *Johnston* 5353.

RANGE: Gravelly and sandy soils on the coastal desert of Atacama and Antofagasta.

CHILE. Antofagasta: Antofagasta, 1925, *Johnston* 3632 (G, US); Punta Reyes near Miguel Diaz, 1925, *Johnston* 5353 (G, type of *A. melanogonatus*). Atacama: Morro de Copiapo, southwest of Caldera, sandy washes above beach, flowers pinkish white, Oct. 21, 1938, *Worth & Morrison* 16183 (G); Caldera, *Gigoux* (G); Caldera, 1885, *Borchers* (BM); Monte Amargo, 200 m. alt., 1924, *Werdermann* 458 (G, K, BD); near Copiapo, Sept. 1854, *Lechler* 2805 (K); Chañarillo, Sept. 1876, ex *Philippi* (G, LP, isotypes of *A. Rengifo*). Indefinite: Desert of Atacama, *Geisse*, sub *Morong* 98 (NY) and *Morong* 1165 (G, NY, US, K); Atacama Desert, ex *Philippi* as *A. Rengifo* (BD, US); ? Vicuña, Oct. 1926, *Claude Joseph* 4597 (US).

This species is prevailingly annual and erect. It is very closely related to *A. nudus* and possibly may not be separable from that more southern species. The legumes are strongly compressed and have nearly parallel sides. They may be permanently strigose or become glabrescent. The corollas of *A. Doddi* and *A. nudus* are very similar in size and form, but the coloration in the latter species is more intense. *Astragalus Doddi* and *A. Rengifo* are evidently conspecific. The more northern form described as *A. melanogonatus* is essentially similar differing chiefly in the broader, oblong rather than linear, leaflets.

45. *Astragalus Berteri* Colla, Mem. R. Accad. Sci. Torino 37: 55, t. 9 (1832), and Pl. Rarior. Bertero. 19, t. 9 (1831?); Reiche, Anal. Univ. Chile 97: 546 (1897), and Fl. Chile 2: 89 (1898).—Based upon material given as from "locis aridis de la Leona secus rivum Cachapual," collected by Bertero.

Astragalus prostratus Hooker & Arnott, Bot. Voy. Beechey 18 (1830), and Bot. Misc. 3: 187 (1832). Not Scop. (1786–88).—Based upon collections from Concepcion, *Lay* and *Collie*.

Astragalus alberjilla Steudel, Nom. ed. 2, 1: 159 (1840), nomen.—Given as based upon *Bertero* 65 from prov. Colchagua.

Phaca grata Clos in Gay, Fl. Chile 2: 92 (1846).—Type collected in "Chile" by Gay.

Astragalus gratus (Clos) Reiche, Anal. Univ. Chile 87: 570 (1897), and Fl. Chile 2: 113 (1898).

Astragalus filifolius Clos in Gay, Fl. Chile 2: 111 (1846).—Type collected between La Serena and Arqueros, Oct. 1833, *Gay* 141.

Phaca elongata Philippi, Linnaea 33: 43 (1864).—"In Andibus de Chillan dictus reperitur."

Astragalus elongatus (Phil.) Reiche, Anal. Univ. Chile 97: 568 (1897), and Fl. Chile 2: 111 (1898). Not Willd. (1803).

Phaca concinna Philippi, Linnaea 33: 44 (1864).—"In montibus elatus praedii Catemu prov. Aconcagua inveni."

Astragalus concinnus (Phil.) Reiche, Anal. Univ. Chile 97: 568 (1897), and Fl. Chile 2: 111 (1897).

Astragalus cauquenensis Philippi, Anal. Univ. Chile 41: 691 (1872).—Type from Baños de Cauquenes, prov. Colchagua.

Astragalus pencanus Philippi, Anal. Univ. Chile 84: 30 (1893).—Based upon collections from Cerro de Caracol near Concepcion, Jan. 1887, *Philippi*, and from Hac. de Almendoro, Araucania.

Tragacantha longior Kuntze, Rev. Gen. 2: 941 (1891).—Based upon *P. elongata* Phil. *Astragalus elongatus* (Phil.) Reiche, not Willd. (1803).

Astragalus Rhudolphi Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 265 (1902).—Based upon *P. elongata* Phil., not *Astragalus elongatus* Willd. (1803).

RANGE: Central Chile, along the coast and east to the base of the cordilleras, from Coquimbo south to Concepcion.

CHILE. Atacama: Caldera, Oct. 1894, *Gigoux* 10 (G). Coquimbo: Rivadavia, 900 m., Sept. 17, 1936, *Montero* 2849 (G); rare on dry hills along road between La Serena and Arqueros, Oct. 1833, *Gay* 141 (Paris, type of *A. filifolius*); prov. Coquimbo, *Gay* as *A. filifolius* (G); Loma Fray Jorge, 1917, *Skottsberg* 1467 (Stock). Aconcagua: Las Palmas de Pedegua, 1300 m. alt., Sept. 1933, *Grandjot* (Grandjot); indefinite [Hac. Catemu], ex *Philippi* as *P. concinna* (BD, Stock); Valparaíso, *Cuming* 736 (K). Santiago: Colina, 1825, *Macrae* (K); Baños de Colina, *Bridges* (K); Curacavi, Oct. 1898, *Castillo* 14 (G). Colchagua: near Rio Cachapoal, Sept. 1928, *Bertero* 65 (NY, Del); along Rio Cachapoal near San Joaquín, Oct. 1829, *Bertero* 65 (Paris, type of *A. alberjilla*); indefinite, *Bertero* as *A. Berteri* (BD); Rancagua, ex *Philippi*, no. 212, as *A. amatus* (BD); Baños de Cauquenes, 1867, *Philippi* as *A. cauquenensis* (BD); Cauquenes, Oct. 1922, *Claude Joseph* 1824 (US). Talca: Talca, Oct. 1921, *Claude Joseph* 1670 (US). Nuble: Cordillera Chillan, Dec. 1855, *Germain* (Santiago, ? type of *P. elongata*); General Cruz, arenales del Itata, 101 m. alt., 1934, *Montero* 1925 (G). Concepcion: Tome, Nov. 1925, *Claude Joseph* 4035 (US); Concepcion, *Beechey* Voy. (K, type of *A. prostratus*); Concepcion, *Reed* (K); San Miguel, Nov. 1933, *Barros* 124 (G); slopes of Cerro Caracol, Concepcion, 1895, *Brenning* (BD); prostrate on summit of Cerro Caracol, 1903, *Scott Elliot* 115 (BM); near falls of Rio Laja, 200 m. alt., open pasture land, *West* 5093 (Univ. Calif.). Indefinite: "Chile," *Gay* (Paris, type of *A. gratus*); Loncoche, Sept. 1926, *Claude Joseph* 4320 (US).

As here treated *A. Berteri* is almost certainly an aggregate of several species or good geographical varieties. The specimens available to me have been not only too few in number but also too deficient in fruiting structures for me to propose a segregation of this complex.

The type of *A. Berteri* was collected by Bertero on Cerro de la Leon near the Rio Cachapoal in 1830, and is no doubt similar to other collections at this locality made in 1828 and 1829 and distributed under his number 65. This number, however, is an aggregate consisting of *A. orthocarpus* and two forms of *A. Berteri*, one of the latter with strigose, the other with glabrous ovary. Colla describes the fruit as "glabriuscula," rather than glaberrima, and we may assume he had the fruiting plant from Bertero, found most widely in herbaria under Bertero 65, in which, though the fruit appears to be glabrous, it is actually sparsely strigose when viewed under a lens. Colla described the fruit as triquetrous, but his illustration and Bertero's specimens show the lower suture to be distinctly inflexed and the lateral faces of the pod plane and almost parallel. The herbage is silky strigose. This typical form of the species, ranging along the base of the cordilleras, appears to have synonyms in *P. grata*, *A. alberjilla*, *P. concinna*, *P. cauquenensis* and *A. elongatus*.

Growing in the coastal area, from Concepcion to Coquimbo and Atacama, is another form of this aggregate. This is usually glabrescent. It has well developed very slender stems bearing elongate peduncles frequently twice as long as the subtending leaf. The leaflets are usually

very slender. In southern plants they may become emarginate at the apex. The following names apply to this coastal form: *A. prostratus*, *A. filifolius*, and *A. puncanus*.

These two principal forms, that along the coast and that in the drier interior, vary much in the form, color, proportions and size of the corolla-parts. I suspect that a thorough study of the corollas will aid in delimiting segregates from this complex. I have made a prolonged attempt to find characters which would sharply separate the coastal and interior plants and so reduce some of the obvious complexity of the species. My inability to achieve this I am now convinced is due to the fact that not two but probably four or five species or varieties are involved. However, the following attempt to contrast the coastal and interior forms may be of interest:

Plant erect or the short stems decumbent only at the base, cinereous to canescent with abundant appressed hairs; pods usually deltoid in cross-section, broadly inflexed below; montane.....*A. Berteri typicus*
 Plant loosely decumbent with slender elongate spreading stems, green or cinereous with sparse appressed hairs or subglabrous; pods laterally much compressed, narrowly sagittate in cross-section, deeply and narrowly intruded below; coastal....."*A. filifolius*"

46. *Astragalus Germaini* Philippi, Linnaea 28: 621 (1857); Reiche, Anal. Univ. Chile 97: 547 (1897), and Fl. Chile 2: 90 (1898).—Type from Las Arañas, Cord. Santiago, *Philippi*.

Astragalus Segethi Philippi, Linnaea 33: 47 (1864).—Type from Las Arañas, Cord. Santiago, *Philippi*.

Astragalus dilectus Philippi, Anal. Univ. Chile 41: 690 (1872).—Type from Andes de Talcarehue, prov. Colchagua.

Astragalus Closianus Philippi, Anal. Univ. Chile 41: 691 (1872).—Type from near Baños de Cauquenes, prov. Colchagua, Oct. 1867, *Philippi*.

Astragalus Dessaueri Philippi, Anal. Univ. Chile 84: 26 (1893).—Type from Cerro de las Viscachas, Est. Cauquene, prov. Colchagua, *de Dessauer*.

Astragalus alfalfalis Philippi, Anal. Univ. Chile 84: 29 (1893).—Type from Valle del Rio Colorado, prov. Santiago, 1700 m. alt., Jan. 1888, *Philippi*.

Astragalus azureus Philippi ex Reiche, Anal. Univ. Chile 97: 548 (1897), and Fl. Chile 2: 91 (1898).—Type from the cordillera de Curico.

Astragalus Germaini var. *azureus* Philippi ex Fries, Nova Acta R. Soc. Sci. Upsala ser. IV, 1¹: 135 (1905).

RANGE: Cordilleras of Santiago, Colchagua and Curico.

CHILE. Santiago: Cord. de Santiago, ex *Philippi* as *A. Germaini* (BD); mountains east of Santiago, 900 m. alt., Nov. 23, 1900, *Hastings* 191 (US); Queltehues, 1700 m. alt., 1927, *Montero* 324 (K); Queb. del Manzano, Valle del Maipo, Nov. 4, 1930, *Pirion* 1242 and 1243 (G); El Manzano, Nov. 1937, *Espinosa* 17 (G); Divisadero de Lagunillos near San Jose de Maipo, 1936, *Looser* 3612 (G). Colchagua: Valle del Clarillo, 1200 m. alt., Nov. 1933, *Grandjot* (Grandjot).

A species evidently related to *A. Berteri* but readily distinguished by its firm glabrous triquetrous fruit, its usually obtuse or retuse leaflets, and its montane distribution. In having a triquetrous fruit with a broad flat lower face *A. Germaini* is similar to *A. carinatus* of the eastern slopes of the Andes.

47. *Astragalus Garbancillo*, Cavanilles, Icon. et Descr. Pl. 1: 59, t. 85 (1791).—Based upon collections from the puna near Tarma and from the prov. Huaro-chiri, Peru, and upon material cultivated at Madrid.
- Astragalus unifultus* L'Heritier, Stirp. Nov. 6: 168 (1791-92).—Type from Peru, Dombey.
- Astragalus Benthamianus* Gillies ex Hooker & Arnott, Bot. Misc. 3: 187 (1832).—Type from El Alto de las Manantiales, Mendoza, Gillies.
- Astragalus minor* Clos in Gay, Fl. Chile 2: 107 (1846).—Type given as from Arqueros, prov. Coquimbo, Chile, Gay, but probably from Peru.
- Astragalus Mandoni* Rusby, Mem. Torrey Bot. Club 3: 19 (1893).—Based upon Bolivian collections, Sorata, *Mandon* 709 and Mt. Tunari, *Bang* 1022.
- Astragalus Garbancillo* var. *Mandoni* (Rusby) Macbride, Field Mus. Pub. Bot. 8: 100 (1930).

This is the most widely distributed and the most commonly collected species of South American *Astragalus*. It ranges at middle altitudes from central Peru southward to the Tucuman and Mendoza areas in Argentina. In central Peru it has been collected in the departments of Libertad, Ancash, Junin, Huanuco, Huancavalica and Lima at 2000 to 3500 m. altitude. In southern Peru it is known from the departments of Puna and Cuzco. In Bolivia it is best known and has been much collected about La Paz and Lake Titicaca. From there it ranges southward through eastern Oruro and southern Cochabamba and on through central and eastern Potosí, Camargo and Tarija into Argentina. Much of its range in Bolivia is hence in the Yungas. The plant evidently affects the more mesophytic and more dissected country east of the puna. Within Argentina it extends through Los Andes, Jujuy and Salta reaching to Tucuman (2000-3400 m. alt.), and further southward through Catamarca, La Rioja (Sierra Famatina) and San Juan (Leoncito, *Echegary*; Cord. Colamgüil, 3150 m. alt., *Perez Moreau* 30/109) to its southern limit in northern Mendoza (Portez. de los Chilcas, 2000 m. alt., *Semper* 4261; Alto de los Manantiales, *Gillies*). With the exception of one very questionable specimen, there is no record of the species in Chile. It reaches the Pacific Slope only in central Peru.

Within our area *A. Garbancillo* is very distinct and has no close relative. The difficulties in delimiting the species are confined to central Peru where it appears to have given rise to the evidently related *A. Pickeringii* Gray, *A. alienus* Gray and possibly also *A. romasanus* Ulbrich, cf. Johnston, Jour. Arnold Arb. 19: 92-95 (1938). Throughout its wide range *A. Garbancillo* is rather variable. Some of its variations seem to be vaguely correlated with geography, but none of them definitely enough to warrant any nomenclatorial recognition at the present time.

The type collection of *A. unifultus* is a plant with the stems pallid and strigose. It much resembles the common form found in the department of Junin. I suspect that it probably came from that section of central Peru. Judging from the original description and illustration of *A. Garbancillo*, it must be a very similar plant from the same region. Plants very similar to the type of *A. unifultus* are the common and usual form of the species in western Bolivia and Argentina.

The name *A. Garbancillo* Cav. appears to have six months or even a year priority over *A. unifultus* L'Herit. The former was published in volume one of Cavanilles' *Icones*, which is dated in the preface Jan. 1791, and was apparently issued the same year. This date has never been questioned. L'Heritier's species, however, appeared in the sixth fascicle of his *Stirpes Novae*, which, though bearing the title-page date 1785, was actually issued much later. Britten & Woodward, *Jour. Bot.* 43: 267-68 (1902), accept the date of the sixth fascicle as being doubtfully December 1891. A contemporary reviewer, Usteri, *Neue Annalen der Botanik*, pt. 2, p. 11 (1794), however, states that this fascicle "quanquam titulus annum editionis 1785 prae se ferat, non tamen nisi medio anno 1792 evulgatus est." Hence there seems good reason for accepting Cavanilles' binomial as the prior name.

The commonest form of *A. Garbancillo* in northern Bolivia and southern Peru is a rather slender more or less fruticulose plant with the stems and herbage green and rather sparsely strigose. One of the extremes of this form has been described as *A. Mandoni*. I have seen similar forms from various parts of the range of the species.

When it was published, *A. minor* was given as having been collected by Gay at Arqueros, a mining region at the base of the cordilleras northeast of Coquimbo, Chile. The type at Paris, however, is associated merely with a printed label indicating that the plant was collected by Gay in Chile. The single specimen is in flower. The stems are slender, erect and thinly strigose. The leaves are also sparsely strigose. The whole aspect of the plant is that of the forms of the species found in southern Peru, a region where Gay is known to have also collected. I believe that the type of *A. minor* is another example of the many cases of mixed and confused collections to be found among Gay's Chilean plants. I do not believe that the type was collected in Chile.

The type of *A. Benthamianus* is one of the two collections of *A. Garbancillo* which I have seen from Mendoza, at the southern limit of the species. The specimens are mature ones with ripe fruit and withered corollas. The coarse stems appear to have been white and strigose when young.

Besides the slender green form and the stouter white-strigose typical form of *A. Garbancillo* there is another variation that deserves some comment. The flowers of the species usually average about 15 mm. in length. In northern Argentina and southern Bolivia there are certain excessively vigorous luxuriant forms which produce flowers 20 mm. long or more. These plants may be green or white-strigose. Characteristic specimens of this vigorous plant have been seen from the mountains of Tucuman (*Lorentz & Hieronymus* 694; *Venturi* 4661), from the province of Jujuy (*Hofsten* 754) and from the department of Tarija (*Fiebrig* 2469a). This coarse, large-flowered plant may possibly merit a name.

The poisonous qualities of this species have long been known. Awschalom, *Lab. Quimica Analitica*, Univ. Tucuman, Pub. no. 1: 1-29 (1928), has studied the species and has identified the saponin.

48. *Astragalus arequipensis* Vogel, Verhandl. K. Leop.-Carol. Akad. Naturf. 19: suppl. 17 (1843).—Type from near Arequipa, 3000 m. alt., *Meyen*.
Astragalus Orbignyianus Weddell, Chlor. Andina 2: 260 (1861).—Type from the prov. Carangas, *d'Orbigny 1437*.
Astragalus drepanophorus Grisebach, Abh. K. Gess. Wiss. Göttingen 24: 102 (1879).—Type from La Cienega, Tucuman, 1874, *Hieronymus & Lorentz*.
Astragalus bolivianus Philippi, Cat. Pl. Itin. Tarapaca 15 (1891); Reiche, Anal. Univ. Chile 97: 539 (1897), and Fl. Chile 2: 82 (1898).—Described from collections from Quebrada de Calalaste, Mifíque, and Sitani, 3500–3700 m. alt.
Astragalus sinocarpus Rusby, Mem. Torrey Bot. Club 3: 19 (1893).—Type from near La Paz, 1890, *Bang 174*.

RANGE: High mountains of northern Argentina northward over the Bolivian plateau to southern Peru.

PERU. Arequipa: Arequipa, *Meyen* (BD, type of *A. arequipensis*); near Arequipa 2000–2500 m. alt., 1923, *Guenther & Buchtien 1107, 1109, 1113* and *1115* (Hamb); between Arequipa and Puna Lagunillas, 4300 m. alt., 1934, *Hammarlund 73* (Stock); between Arequipa and Puna Sumbay, 4060 m. alt., 1933, *Hammarlund 79* (Stock). Puno: Chuquibambillo, 3950 m. alt., 1925, *Pennell 13351* (G, US, FM); Azangaro, June 1854, *Lechler 3243* (K); Occa Pampa, Huancané, 3250 m. alt., 1919, *Shepard 83* (G, US); Pucará, 1902, *Weberbauer 438A* (BD); Puno, *Martenet 575* (Paris); Juliaca, May 16, 1902, *Williams 2513* (US).

BOLIVIA. La Paz: Guarina, 1865, *Raimondi 10515* (BD); prov. Omasuyos, 3900–4000 m. alt., *Mandon 710* (G, K, BM, Del); near La Paz, 3000 m. alt., 1890, *Bang 174* (NY, type of *A. sinocarpus*; G, US, K, BM, BD); between Palca and La Paz, 4000 m. alt., 1910, *Pflanz 373* (BD); Valle de ChuquiagUILlo east of La Paz, 3500–4000 m. alt., 1906, *Hauthal 224* (BD); Isla del Sol, Titicaca, 3840 m. alt., *Buchtien 2870* (US); Tiahuanaco, 1903, *Hill 120* (K); near Viacha, 3900 m. alt., 1907, *Buchtien 625* (US, BD); Paz de Azacucho, Corocoro, 1846, *Weddell 4338* (Paris). Oruro: Pajana, 4100 m. alt., 1908, *Buchtien 1812* (US, BD); Prov. Carangas, west of Oruro, *d'Orbigny 1437* (Paris, type of *A. Orbignyianus*). Potosí: Quechisla, prov. Nor Chichas, 3400 m. alt., 1932, *Cardenas 305* (US); Lagunillas, 3800 m. alt., 1933, *Cardenas 381* (US); Uyuni, Oct. 3, 1894, *Kuntze* (NY, US, BD); Chiguana, 3700 m. alt., 1921, *Asplund 6127* (US) and *3077* (Upsala). Chuquisaca: mountains between Pomabamba and Comargo, *Weddell 3981B* (Paris). Tarija: Calderillo, 3100 m. alt., Jan. 6, 1904, *Fiebrig 2469* in pt. (BD).

CHILE. Arica: Ancara, Cord. Volcan Tacora, ca. 4300 m. alt., April 1926, *Werdermann 1119* (G, K, BD).

ARGENTINA. Los Andes: Calalaste, Jan. 1885, *Philippi* (US, K, BD, isotypes of *A. bolivianus*); Mina Concordia, Feb. 26, 1927, *Castellanos 28/824* (G). Jujuy: puna near Yavi, May 1873, *Lorentz & Hieronymus 702* (BD); Moreno, 3500 m. alt., 1901, *Fries 759* (Stock). Salta: Cerro de Cachi, 3500–4000 m. alt., *Venturi 6700* and *6706* (US); Cuesta de Arca to Trancas, Jan. 1897, *Spegazzini* (LP). Catamarca: Yutuyaco, dept. Andalgalá, *Jorgensen 1629* (G); Chucula, Feb. 2, 1930, *Castellanos 30/520* (G). Tucuman: La Cienega, 1874, *Hieronymus & Lorentz 663* (US, FM, BD, isotype of *A. drepanophorus*) and *693* (FM, K, BD); La Cienega, dept. Tafí, 2800 m. alt., 1933, *Burkart 5390* (G); La Queñua, dept. Tafí, 3000 m. alt., Jan. 1930, *Parodi 10769* (G) and *Burkart 5389* (G); Lara, Jan. 1912, *Rodriguez 261* (G); Est. Las Pavas, dept. Chicligasta, 3500 m. alt., *Venturi 4710* (G, US). La Rioja: Corral Colorado, Sierra Famatina, Feb. 12, 1879, *Hieronymus & Niederlein* (BD). San Juan: Las Cabeceras de Leoncito, Jan. 1876, *Echegaray* (BD).

The leaves of this species are large and coarse and much surpass the inflorescence. The flowers are small, congested and short-pedunculate. The stems have short internodes and are usually less than a decimeter long, and usually spreading. The calyx is black hairy. The triquetrous

fruit is characteristically lunate in outline and inside has a well developed membranous false septum. The synonyms I have listed all evidently belong to trivial phases of this readily recognized species. The species has only two close relatives, *A. Brackenridgei* Gray (cf. Johnston, Jour. Arnold Arb. 19: 95. 1938) of central Peru and *A. cryptanthus* Wedd. of the Bolivian Plateau. It is quite possible that the former is only a geographical variant and that the latter is only a freak glabrescent form of the present species.

49. *Astragalus cryptanthus* Weddell, Chlor. Andina 2: 258 (1861).—Type from la quebrada de las Lagunas de Potosi, *d'Orbigny* 1435.

BOLIVIA. Potosi: near snow-line, Queb. de las Lagunas de Potosi, *d'Orbigny* 1435 (Paris, type). La Paz: La Paz, Aug. 24, 1901, *Williams* 2351 (US, NY).

CHILE. Arica: Chislluma, Cord. de Volcan Tacora, ca. 4500 m. alt., *Werdermann* 1159 (G, K, BD).

This peculiar plant is evidently related to *A. arequipensis* and may be only a very peculiar form of it. It is apparently rare for I have seen only three different collections, all remarkably similar though from widely separated stations, and all from within the range of *A. arequipensis*. The plants are distinguished from *A. arequipensis* by their bright green color and very sparse indument. The stems also tend to be more elongate and the small leaves somewhat more succulent. The fruit is glabrous and may be lunate or may be short and oblong as in the related *A. Brackenridgei* of central Peru.

50. *Astragalus Sanctae-Crucis* Spegazzini, Rev. Fac. Agron. y Vet. La Plata 3: 505 (1897).—Type from Monte Leon near the Rio Santa Cruz, Patagonia, *Spegazzini*.

RANGE: Along the coast of Patagonia in sands and gravel.

ARGENTINA. Santa Cruz: Minerale, 200 m. alt., Oct. 28 and Nov. 20, 1929, *Donat* 196 (G, NY, K); Monte Leon near Santa Cruz, in gravel, 1882, *Spegazzini* (type, La Plata). Chubut: campo near Cabo Raso, *Fischer* (LP). Rio Negro: Viedma, medianos del Faro, Nov. 14, 1928, *Castellanos* 28/1139 (G). Buenos Aires: Necochea, dunes, Jan. 4, 1930, *Cabrera* 1303 (G); Punta Negra, 15 km. s. of Necochea, shifting sand near seashore, corolla blue, base of petals white, Dec. 12, 1938, *Eyerdam*, *Beetle & Grondona* 23728 (G).

Without any close affinities in South America, this plant probably has its closest relatives in the group of *A. Nuttallianus* of North America. It is prostrate and has very elongate straight subcylindrical strict pods. The false septum is well developed and nearly divides the fruit into two cells.

51. *Astragalus orthocarpus*, nom. nov.

Phaca oligantha Philippi, Linnaea 33: 42 (1864).—Type from the base of the cordillera in the prov. Colchagua, Chile.

Astragalus oliganthus (Phil.) Reiche, Anal. Univ. Chile 97: 567 (1897), and Fl. Chile 2: 110 (1898). Not Kar. & Kir. (1842).

RANGE: Known only from the province of Colchagua, Chile, at the base of the cordilleras.

CHILE. Colchagua: Monte de la Leon, *Bertero* 65 (BM, Boiss, Paris); without locality, *Bridges* (G, K, BM, BD) and *ex Philippi* as *P. oligantha* (BD, Del, Boiss, Stock); Centinela, 400 m. alt., 1928, *Montero* 1382 (G).

A species readily confused with *A. Berteri* and perhaps most closely related to it. It may be distinguished from *A. Berteri* by its erect or ascending, short and stout, rather plump legumes. In habit the plant seems to be more slender than its relative, having elongate leafy prostrate or decumbent stems and apparently slightly smaller flowers. The fruit has convex valves which become tough and hard. The lower suture is situated in a broad shallow depression. Flowering plants of *A. orthocarpus* and *A. Berteri* are distinguished with difficulty. Among the species listed as synonyms of *A. Berteri* there are several founded on flowering plants which conceivably may be proved to belong to the present plant and so provide it with an older name.

52. *Astragalus Domeykoanus* (Phil.) Reiche, Anal. Univ. Chile 97: 550 (1897), and Fl. Chile 2: 93 (1898).

Phaca Domeykoana Philippi, Anal. Univ. Chile 84: 18 (1893).—Type from Turrieta, prov. Talca, lat. 35° 30' S., Feb. 1879, *F. Philippi*.

Phaca orites Philippi, Anal. Univ. Chile 84: 24 (1893).—Type from Gualletué, cord. prov. Cautin, Feb. 1887, *Rahmer*.

Astragalus orites (Phil.) Reiche, Anal. Univ. Chile 97: 551 (1897), and Fl. Chile 2: 94 (1898).

Tragacantha procumbens var. *glabrescens* Kuntze, Rev. Gen. 3: 73 (1898).—Based upon specimen from "Patagonia," *Moreno & Tonini* 727.

RANGE: Along the cordilleras from Talca and Neuquen southward to southern Patagonia.

CHILE. Talca: Turrieta, Cordilleras east of Talca, Feb. 1879, *F. Philippi* (LP, isotype of *A. Domeykoanus*). Maule: Cord. de Maule, *Germain* (K, BM); Andes de Antuco, 2400 m. alt., 1828, *Poeppig* (Munich); Cord. de Linares, ex *Philippi* 215 (BD). Cautin: Araucania, ex *Philippi* as *P. araucanus* (K, BD); Pisotypes of *P. orites*).

ARGENTINA. Neuquen: Pino Hachado, 1920, *Parodi* 2284 (Parodi); Cajon de Pino Hachado, Sept. 1900, *Spegazzini* (LP); Cerro Colohuincul, moist sandy hillside, 1500–1800 m. alt., Dec. 17, 1926, *Comber* 878 (K); Polcahue, 1200 m. alt. Jan. 16, 1926, *Comber* 458 (K); Valle Escondida, iron-bog in valley, 1800 m. alt., *Comber* 279 (K); Lagunas Lui Cullin, *Comber* 1169 (K); Sierra Mamuil Malal, 1800 m. alt., Jan. 3, 1927, *Comber* 926 (K). Rio Negro: Bariloche, Cerro Gutierrez, 1500 m. alt., Feb. 28, 1905, *Buchtien* 23 (US, K). Chubut: mountains near Carren-leofu, 1901, *Illin* (LP); Valle de la Laguna Blanca, Dec. 20, 1901, *Koslowsky* 187 (K); Valle de la Lago Blanco, Dec. 1903, no collector given (LP). Santa Cruz: near Lago Argentino, 1000 m. alt., Jan. 30, 1905, *Dusen* 5765 (Stock); Lago Posadas, 800 m. alt., Dec. 20, 1908, *Skottsberg* 760 (Stock). Indefinite: Patagonia, *Moreno & Tonini* 727 (NY, type of var. *glabrescens*).

This species is very closely related to the poorly understood *A. compliatus* of the andes of Mendoza. It may be no more than a variety of that species with sparsely and inconspicuously strigose or glabrous leaflets. It has obcordate or retuse obovate-oblong leaflets that are normally folded along the midrib. In texture they are rather thick and fleshy. The fruit is apparently rather variable. Most specimens have sparsely black-strigose pods about 8 mm. long which are either distinctly triangular in cross-section or are more or less compressed. They have a distinctly intruded lower suture. In some specimens the pods are not only larger (10–14 mm. long) and of more fragile texture, but are also less angular

and more or less inflated. The fruit is then broadly lenticular in cross-section with the lower margin only weakly flattened. I am unable to correlate these surprising variations in fruit with any other structural variations of the plant or with geography.

The type-collection of *A. Domeykoanus* is in the flowering condition and has no fruit. It is very similar to other collections from the cordilleras of south-central Chile which have short angulate pods that are contracted apically into a short beak. These plants are all low and spreading and come from near the continental divide.

The type of *P. orites* comes from the headwaters of the Rio Bio Bio. The fruit is of the short angulate type. The leaflets though rather large are characteristically glabrous, deeply notched and evidently folded as in true *A. Domeykoanus*, but the stems are about 2 dm. long and appear to be erect. These differences in leaf-size and growth-habit may well be ecological.

The type sheet of *T. procumbens* var. *glabrescens*, labeled merely as from Patagonia, is a mixture of *A. Domeykoanus* and *A. Cruckshanksii*. The specimen of the former is practically glabrous; that of the latter is evidently strigose. Since the material of *A. Domeykoanus* is more appropriately covered by the epithet "*glabrescens*," I am of the opinion that Kuntze's variety had best be treated as a synonym of the present species.

53. *Astragalus complicatus* Gillies ex Hooker & Arnott, Bot. Misc. 3: 187 (1832).

— Type from El Cerro de la Polcura, *Gillies*.

RANGE: Known only from the type locality.

ARGENTINA. Mendoza: El Cerro de la Polcura, andes of Mendoza, *Gillies*, (K, type).

This species is known only from a single collection made over a hundred years ago. It is evidently related to *A. Domeykoanus*, which ranges widely along the Andes further south. It differs from the southern plants only in its distinctly strigose foliage. The type came from a locality 200 to 300 km. north of the most northern known station of its relative. The relationship between the two species is so clear that I shall not be surprised if new collections from Mendoza prove that the species cannot be separated by the characters given. The name *A. complicatus*, being the oldest, must then be applied to the larger specific concept.

54. *Astragalus punae*, sp. nov.

Planta cinerea; caulibus pluribus decumbentibus 6–8 cm. longis simplicibus vel basim versus longi-ramosis sparse plus minusve adpresse villosis ca. 1.5 mm. crassis; foliis pilis 0.5–1 mm. longis sinuatis leviter adpressis griseo-vestitis; rhachibus 3–5 cm. longis infra medium nudis; foliolis 9–11-jugatis plicatis, 4–7 mm. longis ca. 2 mm. latis oblongis vel oblongo-ellipticis supra plus minusve glabris subtus villosis apice obtusis vel truncatis saepe emarginatis; stipulis 4–5 mm. longis membranaceis sparse strigosis; racemis 5–10-floris capitato-congestis 0.7–1 cm. diametro saepe in axillis foliorum superiorum subsessilibus (0–5 mm. longe pedunculatis); bracteis lanceolatis 3–4 mm. longis; calycibus sessilibus 3–4 mm. longis

subtomentosis, lobis linearibus 1–1.5 mm. longis; vexillo 6 mm. longo, lamina 2.5 mm. lata apice emarginata; alis 5 mm. longis quam carina 1.5 mm. longioribus; leguminibus ascendentibus 4–5 mm. longis 2 mm. crassis 2–2.5 mm. altis dense albiterque villosis 4-seminatis unilocularibus, intus septum membranaceum haud gerentibus, a latere viso margine superiore rectis et margine inferiore convexis, apice acutis, basi rotundis, sutura inferiore evidenter 0.7–1 mm. profundeque introflexa.

ARGENTINA. Puna de Atacama, "Garbancillo de la Puna," herb. *Spegazzini*, no. 2111, sub "*A. bolivianus*?" (La Plata, type).

For this very distinct species, which I know only from the type, I can suggest no close relative. In habit it somewhat suggests a slender villous form of *A. arequipensis*, but it is certainly not a close relative of that species. It also suggests some of the coarse forms of *A. micranthellus* and possibly may be closely related to that species. The subsessile dense axillary clusters of flowers, the villous indument, and the small ovoid villous pods are outstanding characters of *A. punae*. The fruit is not tough in texture. It completely lacks a false septum.

55. *Astragalus micranthellus* Weddell, Chlor. Andina 2: 262 (1861).—Original collections from near Puno, Peru, *Weddell* 4503, and from near La Laguna de Potosi, *d'Orbigny* 1436.

Astragalus capitellus Britton, Bull. Torrey Bot. Club 16: 260 (1889).—Type from near La Paz, *Rusby* 1005.

Tragacantha arequibensis var. *minima* Kuntze, Rev. Gen. 3: 73 (1898).—Type from between Uyuni and Machacamarca, Bolivia, *Kuntze*.

Tragacantha arequibensis var. *tenuifoliola* Kuntze, Rev. Gen. 3: 73 (1898).—Type from near Tiraque, *Kuntze*.

Astragalus patancanus Ulbrich, Bot. Jahrb. 37: 417 (1906).—Type from Puna Patanca, Tarija, *Fiebrig* 2612.

RANGE: High altitudes, on punas, from southernmost Peru, across Bolivia, to northern Argentina.

PERU. Puno: near Juliaca, 1903, *Hill* 127 and 128 (K); near Puno, *Weddell* 4503 (Paris, type of *A. micranthellus*). Arequipa: near Arequipa, 2000–2500 m. alt., 1923, *Guenther & Buchtien* (Hamb). Moquegua: Ubinas, March 1864, *Raimondi* 11725 (BD).

BOLIVIA. La Paz: La Paz, 3000–4100 m. alt., *Buchtien* 2872 (US), *Buchtien* 626 (US, BD) and *Rusby* 1005 (NY, type of *A. capitellus*); Potopoto near La Paz, 3790 m. alt., 1861, *Mandon* (K, BM, Del, Stock); Guaqui plateau, 3750 m. alt., 1903, *Hill* 125 (K); Viacha, 3900 m. alt., Jan. 29, 1921, *Asplund* 2110 and 2122 (Upsala); Guaqui, 3900 m. alt., Jan. 31, 1921, *Asplund* 2221 (Upsala); Corocoro, 4000 m. alt., Feb. 15, 1921, *Asplund* 2440 (Upsala); Ulloma, 3800 m. alt., Feb. 21, 1921, *Asplund* 2554 (Upsala); Charaña, 4050 m. alt., March 1, 1921, *Asplund* 2670 (Upsala); between San Pablo and Achacachi, 1903, *Hill* 129 (K). Oruro: Hacienda Huanacroma near Eucaliptus, prov. Cercado, 3800 m. alt., 1934, *Hammarlund* 111 (NY, Stock); Challapata, 3800 m. alt., March 31, 1921, *Asplund* 3282 (Upsala). Cochabamba: Tiraque, Sierra de Santa Cruz, 3000 m. alt., April 1–4, 1892, *Kuntze* (NY, type of var. *tenuifolia*). Potosi: near La Laguna de Potosi, *d'Orbigny* 1436 (Paris, cotype of *A. micranthellus*); Potosi, 4000 m. alt., 1933, *Cardenas* 366 (US); Quechisla, prov. Nor Chicas, 1931, *Cardenas* 82 (G); puna between Uyuni and Machacamarca, March 11, 1892, *Kuntze* (NY, type of var. *minima*); Uyuni, 3700 m. alt., March 25, 1921, *Asplund* 6144 (US) and 3149 (Upsala); Atocha, 3700 m. alt., March 20, 1921, *Asplund* 2999 (Upsala). Sucre: Muyaquiri, prov. Cinti, 1934, *Hammarlund* 386 (Stock). Tarija: Escayadu, 3500 m. alt., 1904, *Fiebrig* 3498E

(BD); Puna Patanca, 3700 m. alt., 1904, *Fiebrig 2612* (BD, type of *A. patancanus*; G, K, Paris).

ARGENTINA. Jujuy: Cerro de Chani, 4000 m. alt., 1929, *Venturi 8526* (US); Moreno, 3500 m. alt., *Fries 809* (Stock); north of Tres Cruces, 1921, *Castellanos 53* (G); Santa Catalina, 3650–4100 m. alt., 1901, *Claren 11465* in pt., 11476, 11419 and 11499 in pt. (Stock). Salta: Cerro de Cachi, 4000–4500 m. alt., 1927, *Venturi 6681* and 6694 (US). Catamarca: Cerro Negro, dept. Andalgalá, 3500 m. alt., *Joergensen 1628* (G, US), 1629 (G). Tucuman: Lara, Trancas, 1912, *Rodriguez 339* (G).

The plants associated here are slender stemmed, depressed, and prostrate or spreading. The small flowers are clustered on peduncles shorter than the subtending leaf. The pods are 5–13 mm. long, sparsely strigose and laterally compressed. The valves of the fruit are flattened and usually about 3 mm. broad. The lower suture is strongly intruded. Under favorable conditions the widely spreading stems may become 1–2 dm. long and loosely branched. Most plants, however, have prostrate stems only 5–10 cm. long. Some of the plants from extreme environments at high altitudes become very reduced and compacted, becoming somewhat caespitose or somewhat pulvinate (e.g. *Venturi 6694*).

Most of the collections treated as *A. atacamensis* by Fries, Nova Acta R. Soc. Sci. Upsala IV, 1¹: 134 (1905), actually belong to *A. micranthellus*. Among the collections cited by Fries, *A. micranthellus* appears in several mixtures; with *A. Bustillosii* (no. 11465), with *A. minimus* (no. 916) and *A. crymophilus* (no. 11499 sub "*A. modestus*"). Hosseus, Bol. Acad. Nac. Cordoba 26: 157 (1921) has noted some of these mixtures and misidentifications.

56. *Astragalus triflorus* (DC.) Gray, Plant. Wright. 2: 45 (1853), as to name-bringing synonym only.

Phaca triflora DeCandolle, Astrag. 62, t. 1 (1802).—Type given as collected in Peru by Dombey.

Astragalus vicüiformis Ulbrich, Bot. Jahrb. 37: 550 (1906).—Type from near Mollendo, *Weberbauer 1504*.

RANGE: Coastal hills, in the Loma Formation, from central Peru to northern Chile.

PERU. Lima: Cerro San Augustin, 300–400 m. alt., 1909, *Weberbauer 5241* (BD); Tablada de Lurin, *Mathews 1005* (K, BM). Arequipa: Lomas de Capac, near Chala, Oct. 1863, *Raimondi 11648* (BD); Loma del Toro, near Atico, Nov. 1863, *Raimondi 11593* (BD); Mollendo, sandy flat at lower edge of the fertile belt, 1902, *Weberbauer 1504* (BD, type of *A. vicüiformis*); Mollendo, *Johnston 3569* (G, K) and *Hitchcock 22364* (US); Mejia, 30–40 m. alt., 1923, *Guenther & Buchtien 273* and 272B (Hamb); Cachendo, 900–1000 m. alt., *Guenther & Buchtien 272B* and 274 (Hamb); Posco, 575 m. alt., 1923, *Guenther & Buchtien 272* (Hamb). Moquegua: Torata, 2200–2300 m. alt., *Weberbauer 7418* (US, K, BD). Indefinite: Peru, *Dombey* (Paris, type of *P. triflora*).

CHILE. Tarapaca: Iquique, *Werdermann 754* (G, K, BM, BD). Antofagasta: Tocopilla, *Johnston 3621* (G) and *Jaffuel 1008* (G); Antofagasta, *Jaffuel 1146* (G).

This very distinct species, a small slender annual of the coastal hills of Peru and northern Chile, was one of the very first members of its genus to have been described from South America. Though the original

plate and description are accurate, the species has been discredited and misunderstood and its name consistently misapplied. DeCandolle based his *P. triflora* upon specimens collected by Dombey in Peru, probably near Lima. The original plate is a careful drawing of a specimen now preserved at Paris! The species is unquestionably the same as that described over a hundred years later as *A. viciiformis* Ulbr!

Much of the confusion enveloping our plant for over a century may be traced back to Kunth, H. B. K. Nov. Gen. 6: 495 (1824). That botanist gave an excellent description and illustration of a plant which Humboldt & Bonpland had collected on the volcano of Jorullo in Mexico and published them under the newly proposed name, *Phaca Candolliana*. He associated that name with the following synonymy, "*Phaca triflora* Decand. Astrag. p. 62. t. 1 (auct. Mu. Paris). Persoon Synops. 2. p. 331." The Mexican plant is very different from the coastal annual of Peru and Chile. Kunth, however, seems to have thought them to be conspecific and various subsequent authors have inferred that the name he coined, *P. Candolliana*, was merely a substitute name for the "Inappropriate and misleading" *P. triflora* DC. Even DeCandolle so considered it, for in his Prodr. 2: 273 (1825), he gives *P. Candolliana* HBK as a synonym of *P. triflora* DC. Most authors have agreed with Jones, Astrag. 105 (1923), that the names *P. Candolliana* and *P. triflora* were not only "intended to be the same" but were originally applied to conspecific plants as well. The prevailing opinion seems to have been that DeCandolle's description and plate were crude and poor (Jones calls them "fanciful") and that his material may have come, not from Peru, but rather from Mexico. This is, of course, thoroughly incorrect and not in accord with the facts. DeCandolle's plate is a good representation of his species, which, we now know, did come from Peru.

There are good reasons for considering that the name *P. Candolliana* HBK. was intended as a substitute for DeCandolle's binomial, *P. triflora*. Personally, however, I feel that Kunth's binomial can well be restricted to the Mexican plant he figured and described. This has been recently done by Rydberg, No. Amer. Fl. 24: 350 (1929).

The accepted name for our plant of Chile and Peru was published by Gray, l.c., as follows: "*A. (Phaca) triflorus. Phaca triflora, DC. Astrag. t. 1 & Prodr. 2. 273. P. Candolliana, H. B. K. Nov. Gen. & Sp. 6. p. 495. t. 586.*" It is evident that Gray accepted *P. triflora* and *P. Candolliana* as conspecific and as applying to the Mexican species as well as to the Texan plant he had in hand. This, of course, was incorrect, but since his nomenclatorial transfer is clearly and expressly founded upon *Phaca triflora* DC, even though he misunderstood DeCandolle's concept, the resulting combination, *Astragalus triflorus* (DC.) Gray must apply to our plant of Chile and Peru. Some authors, however, have insisted that the binomial *A. triflorus* must be applied to the plant of Texas which Gray was discussing when he made the combination, but this is clearly counter to the rules of nomenclature. This confusion of "species-

concept" and "nomenclature" reached its extreme with Sheldon, Minnesota Bot. Studies 1: 140 (1894), who cited "*A. triflorus* A. Gray. Pl. Wr. 2: 45. 1853. excl. syn." as a synonym of *A. Candolleanus* (HBK.) Sheldon and proposed the combination "*A. triflorus* (DC.) Sheldon" for our *Phaca triflora* DC. of South America. The two most recent monographers have agreed in treating *A. triflorus* Gray as based upon *Phaca triflora* DC. Jones, Astrag. 105 (1923) considered it to be a species of both North and South America, while Rydberg, No. Amer. Fl. 24: 350 (1929), treated it as exclusively South American.

57. *Astragalus Famatinae*, sp. nov.

Planta perennis plus minusve argenteo-strigosa; caulibus gracilibus rigidiusculis prostratis 5–18 cm. longis 0.5–1 mm. crassis foliosis (internodiis 0.5–5 cm. longis) e caudice multiceptali radice valida profunda coronato erumpentibus; rhachi folii 5–20 mm. longa supra medium vel usque ad basim foliolata supra canaliculata; foliolis 4–5-jugatis 2–9 mm. longis 1–2 mm. latis ellipticis vel anguste oblongis plus minusve plicatis margine saepe paulo involutis apice rotundis vel obtusis rariter emarginatis subtus strigosis supra plus minusve glabris; stipulis 2–3 mm. longis strigosis ocreatis; racemis axillaribus densifloris 8–12 mm. diametro; pedunculo 1–3 cm. longo folio suffulciente saepe evidenter longiore; floribus saepe 10–15 capitato-congestis; calycibus 2–3 mm. longis, lobis 0.5–1 mm. longis pilis nigris et albis strigosis; pedicellis 0.5–1.5 mm. longis; bracteis 0.5–1 mm. longis oblongis; vexillo corollae 5–7 mm. longo, lamina 3–4 mm. lata; alis 4.5–6.5 mm. longis quam carina 2 mm. longioribus; ovario strigoso; leguminibus oblongis compressis vel prismaticis ca. 1 cm. longis 3–3.5 mm. altis 2–3 mm. crassis sparsissime strigosis 8–10 seminatis, a latere viso utrinque marginibus convexis, sutura inferiore late vel anguste introflexis, intus septum membranaceum ca. 0.5 mm. altum gerentibus.

ARGENTINA. La Rioja: La Incrucijada, Sierra Famatina, 1879, *Hieronymus & Niederlein* 482 (type, Berlin); Los Berros, Sierra Famatina, 1879, *Hieronymus & Niederlein* 586 (BD). San Juan: Quebrada del Salto, Cord. de Colangüil, Jan. 15, 1930, *Perez Moreau* 30/98 (G).

Although with a gross aspect more suggestive of *A. micranthellus*, this well marked species seems to be much more closely related to the habitually dissimilar *A. tarijensis*. The fruit has a somewhat tough texture and seems to be more or less prismatic with the lower face flattened or shallowly and broadly introflexed. Some of the fruit on the type has the lower suture strongly and deeply intruded, but this may be the result of lateral pressure on the fruit when the specimens were pressed. There is a narrow but evident membranous false septum inside the fruit. The fruit of *A. Famatinae*, hence, has a different form (prismatic and oblong) and a firmer texture, as well as a false septum, which distinguishes it from the fruit of *A. micranthellus*. The plant is furthermore clothed with a coarser and somewhat silvery strigosity and hence differs from *A. micranthellus* in indument. The thicker, densely strigose leaflets with entire or only obscurely emarginate apices, and the firmer texture of the pods, readily distinguish *A. Famatinae* from all forms of *A. tarijensis*.

The type of the species has been cited by Hosseus, Bol. Acad. Nac. Cordoba 36: 152 (1921), as *A. modestus*. This is certainly incorrect. Hosseus has cited another specimen (no. 535) collected by Hieronymus & Niederlein in the Sierra Famatina. This latter, only a young specimen at anthesis, I examined as a duplicate in Berlin. In my notes this is assigned to "*A. micranthellus*," but now for various reasons I would wish to re-examine the collection before accepting that identification.

The material cited from San Juan is questionably referred to *A. Famatinae*. It represents a plant evidently related to that of the Sierra Famatina but has stems only 0.5–1 cm. long and has much contracted internodes. The leaves are consequently somewhat tufted and the inflorescence almost scapose. I believe it is a reduced plant conspecific with those from La Rioja. The material of it, however, is very fragmentary and its present disposition must be considered tentative.

58. *Astragalus tarijensis* Weddell, Chlor. Andina 2: 262 (1861).—Type from between Puna Iscaïachi and Valle de Tarija, Bolivia, Weddell 4021.

Astragalus Hieronymi Ulbrich, Bot. Jahrb. 37: 418 (1906).—Based upon collections from Cienega, Tucuman, Lorentz & Hieronymus 580 and Calderillo, Tarija, Fiebrig 2882.

RANGE: Mountains of northwestern Argentina and adjacent Bolivia, mostly above 3000 m. altitude.

BOLIVIA. Tarija: Calderillo, 3400 m. alt., 1904, Fiebrig 2882 (FM, BD, cotype of *A. Hieronymi*); along the descent from Puna de Iscaïachi into Valle de Tarija, 2500–3000 m. alt., Jan. 29–31, 1846, Weddell 4021 (type of *A. tarijensis*, Paris).

ARGENTINA. Jujuy: Tilcara, 3000–3200 m. alt., Venturi 6698 and 7421 (US); Cerro La Soledad, 3500 m. alt., 1928, Venturi 9029 (G, US). Salta: between Cuesta del Arca and Trancas, Dec. 1896, Spegazzini (LP); Pampa Grande, Jan. 1897, Spegazzini (LP); La Laguna, Sierra del Cajon, 3900 m. alt., Jan. 1914, Rodriguez 1317 (G). Catamarca: Cerro Negro, Feb. 9, 1916, Joergensen 1887 (G, US); C. de Aconquija, 3800 m. alt., March 15, 1917, Joergensen 1337 (US); Cerro del Campo Grande, Jan. 1874, Schickendantz 256 (BD); Granadillas, Nov. 1877, Schickendantz 88 (BD); Laguna del Tesoro, 4600 m. alt., 1925, Venturi 6629 (US); Sierra de Anconquija, 4400 m. alt., 1926, Venturi 6623 (US). Tucuman: Lara, Trancas, Jan. 27, 1912, Rodriguez 280 (G); Cumbres Calchaquies, Tañi, 4000–4400 m. alt., Burkart 5402 and 5387 (G) and Parodi 10846 (G); La Queñua, 3000 m. alt., Burkart 5397 (G); La Puerta, 4000 m. alt., Burkart 5395, 5396 and 5388 (G); Peñas Azules, 3400–3500 m. alt., Burkart 5398 (G) and Parodi 10911 (G); Cerro de San Jose, 2700 m. alt., Venturi 3644 (G, US, LP); La Cienega, Lorentz & Hieronymus 580 (K, BD, type of *A. Hieronymi*); Estan. Las Pavas, Chicligasta, 3000 m. alt., Venturi 4681 and 6622 (US); Estan. Santa Rosas, 3800–4400 m. alt., Venturi 3183 (G, US), 4007 (US) and 4749 (G, US, LP). La Rioja: Estacion 6, Camino a La Mejicana, Sierra Famatina, 3300 m. alt., Feb. 1927, Parodi 7954 (G).

The types of *A. tarijensis* and *A. Hieronymi* are very similar in aspect and details. They are evidently conspecific and representative of the most common form of this very variable species. This common form has slender well developed ascending stems, green folded narrowly obcordate leaflets, black-strigose calyces, lanceolate bracts and strigose ovary. There are, unfortunately, frequent departures from this distinctive typical form. At very high altitudes the leafy stems become very short and the plant matted. The apex of the leaflets, usually broadly retuse, may

become rounded and only weakly emarginate, or even entire and actually acute. In outline the leaflets are commonly obcordate or oblong-obcordate. Some plants, evidently forms of *A. tarijensis*, have distinctly oblong, elliptic or even lanceolate leaflets. Most forms of the species have practically glabrous herbage of a characteristic dark green color. But I am also forced to admit in the species some plants having the herbage somewhat cinereous with evident scattered appressed hairs. When the common form of the species varies in only one of the details mentioned, its affinities are not obscured. When, however, several of these aberrant tendencies are exhibited in one plant its general appearance becomes very changed and quite different from that of the typical form. After a consideration of these puzzling forms I have finally been forced to place them under *A. tarijensis* as chance combinations of aberrant characters. They occur within the range of the normal form of the species and are usually represented by single collections. A study of a large series of *A. tarijensis* makes it clear that they are merely variants of this unstable species.

59. *Astragalus Weddellianus* (Kuntze), comb. nov.

Astragalus modestus Weddell, Chlor. Andina 2: 262 (1861). Not Boiss. & Hohen, (1849).—Type from Cuesta de Periguani east of Camargo, *Weddell 3932*.

Tragacantha Weddelliana Kuntze, Rev. Gen. 2: 942 (1891)—Based upon *A. modesta* Wedd.

Astragalus Pilgeri Macbride, Field Mus. Pub. Bot. 11: 25 (1931).—Type from Paucartambo, Cuzco, *Herrera 2315*.

Astragalus punensis Macbride, Field Mus. Pub. Bot. 13 [Fl. Peru 3:]: 400 (1943).—Type from Macusani and Hac. Salcedo, dept. Puna, *Soukup 549*.

RANGE: Rare from southern Peru to northwestern Argentina.

PERU. Cuzco: Hacienda Chuchapaya, Valle del Paucartambo, 3800 m. alt., Feb. 1929, *Herrera 2315* (FM, type of *A. Pilgeri*). Puno: indefinite locality, *Soukup 429* (G) and *549* (G, isotype of *A. punensis*).

BOLIVIA. La Paz: Rinconada, 4200 m. alt., Dec. 16, 1920, *Asplund 1804* (Upsala); Desaguadero, 3900 m. alt., Feb. 3, 1921, *Asplund 6142* (US); Guaqui to Desaguadero, 3850 m. alt., Feb. 3, 1921, *Asplund 2319* (Upsala). Potosi: between San Sebastian and Potosi, 4060 m. alt., Nov. 1932, *Cardenas 281* (G, US). Chuquisaca: Cuesta de Periguani, between Pomabamba and Camargo, prov. Cinti, 3500 m. alt., Jan. 11–13, 1846, *Weddell 3932* (type of *A. modestus*, Paris).

ARGENTINA. Tucuman: puna between La Puerta and Los Cardones, Cumbré Calchaquies, Tañi, 4400 m. alt., Jan. 30, 1933, *Burkart 5384* and *5408* (G). Catamarca: Reales Blancos, Feb. 3, 1930, *Castellanos 30/488* (G).

Assembled here under the name *A. Weddellianus* is a variable group of plants all evidently related to *A. tarijensis* and differing from it only in the reduced habit of growth, glabrous ovary and fruit, and generally more northern distribution. These distinctions are weak and perhaps the plants can be accommodated under *A. tarijensis* as further variants of that variable species.

The type of *A. modestus* has leafy stems 1–2 cm. long, 2–4-flowered peduncles 5–10 mm. long, practically glabrous stems and leaves, and 6–8-jugate elliptic-oblong leaflets. The type of *A. Pilgeri* is sparsely and persistently strigose but is otherwise similar to the type of *A. modestus*. The cited collections of Asplund and Cardenas have more reduced stems

and peduncles than in the type of *A. Pilgeri* but agree with it in other details including pubescence. The collections from Argentina have glabrous herbage and so more closely resemble the type of *A. modestus*. The cited material from Puna, including the type of *A. punensis*, is glabrous and differs in its larger corollas and deeper calyx from other collections examined. Possibly further collecting may prove it to be a distinguishable entity worthy of recognition.

60. *Astragalus Bustillosii* Clos in Gay, Fl. Chile 2: 117 (1846); Wedd. Chlor. Andina 2: 257 (1861).—Type from Cordillera de la Patos, Gay 489.

Phaca depauperata Phil. Fl. Atac. 14 (1860).—Based upon collections from Ag. Veras, and Puquios, *Philippi*.

Astragalus depauperatus (Phil.) Reiche, Anal. Univ. Chile 97: 537 (1897), and Fl. Chile 2: 80 (1898). Not Ledeb. (1831).

Phaca saxifraga Phil. Cat. Pl. Itin. Tarapaca 14 (1891).—Type from Peñon, prov. Atacama, *Philippi*.

Astragalus brachycalyx Phil. Cat. Pl. Itin. Tarapaca 15 (1891); Reiche, Anal. Univ. Chile 97: 538 (1897), and Fl. Chile 2: 81 (1898). Not Fischer (1853).—Type from Near Machuca, prov. Antofagasta, *Philippi*.

Tragacantha atacamensis Kuntze, Rev. Gen. 2: 940 (1891).—Based upon *P. depauperata* Phil.

Astragalus atacamensis (Kuntze) Fries Nova Acta R. Soc. Sci. Upsala, ser. IV, 11: 134 (1905).

Astragalus tarapacanus Speg. Anal. Mus. Nac. Buenos Aires II, 4: 264 (1902).—Based upon *A. brachycalyx* Phil., not Fischer.

RANGE: Moist gravels at high altitudes from Antofagasta and Jujuy south to Tucuman, Mendoza and Coquimbo.

CHILE. Antofagasta: Machuca, lat. 22° 36', *Philippi* (Santiago, type of *A. brachycalyx*). Atacama: Peñon, lat. 26° 50', Jan. 1885, *Philippi* as *P. saxifraga* (US, K, BD); Desert of Atacama, *Philippi* as *P. depauperata* (K, BD, Boiss); Laguna Grande, 3400 m. alt., 1926, *Johnston 5940* (G, US, K); Laguna Chica, 3200 m. alt., 1926, *Johnston 5970* (G, US, Stock); Laguna Valeriano, 4000 m. alt., 1926, *Johnston 6041* (G, US, K, Stock). Coquimbo: Baños del Toro, Jan. 1904, *Reiche* (G); Cord. de Doña Rosa, *herb. Reed* (K); Cord de Los Patos, 3000 m. Jan. 1837, *Gay 489* (Paris, type of *A. Bustillosii*); Polcura, Cord. de Illapel, Jan. 1888, *Philippi* (G); Chile, *Gay* (G).

ARGENTINA. Jujuy: Santa Catalina, 3650 m. alt., 1901, *Claren 11465* in pt. (Stock). Salta: Queb. Quesera, ca. 3500 m. alt., 1932, *Keidel 1* (LP); Cerro de Cachi, 3600 m. alt., 1927, *Venturi 6705* (US). Tucuman: Tafi del Valle, fl. violet, 1907, *herb. Spegazzini 2028* (LP). San Juan: Vega de la Sepultura, Valle Cura, ca. 3800 m. alt., Jan. 7, 1930, *Perez Moreau 30/95* (G). Mendoza: Puente del Inca, March 1908, *herb. Spegazzini 2029* (LP); below Paso de la Cruz Piedra, 3000 m. alt., *Kuntze* (NY).

Among the South American species of the genus *A. Bustillosii* is unique in the possession of slender rhizomes. The slender stems of the plant elongate and spread through the moist sand or gravel in which it grows. A single plant can form a large area of turf. It much resembles *A. minimus* in habit, foliage, and gross aspect and perhaps it is related to that species. It is quickly distinguished from this possible relative, however, by its very different underground parts, its larger flowers, and very different fruit. The pods are strongly compressed laterally and flattened. The lower suture is inflexed only near the base of the pod and the false

septum is absent or only very weakly developed. The valves are commonly 10–13 mm. long and 5–7 mm. broad. The pedicels and peduncles are only slightly more developed than in *A. minimus*. The species is a rather stable one and has a range which lies to the south and west of *A. minimus*. With the possible exception of *A. brachycalyx* Phil., the species I have listed above are all clear synonyms. Through the kindness of Prof. Espinoza I have examined part of the type of *A. brachycalyx*. It appears to be a depauperate plant of *A. Bustillosii* from an unfavorable habitat. The material is scanty and shows only a single immature fruit but seems to fall reasonably well into the present species.

61. *Astragalus uniflorus* DC. Astrag. 243, t. 50 (1802), and Prodr. 2: 306 (1825); Weberb. in Engler & Drude, Veg. Erde 12: 209, fig. 45 (1911).—Type collected by Dombey at Huasa-Huasi, Peru.

Astragalus Herzogii Ulbrich, Mededell. Rijks Herb. 27: 53 (1915).—Type from Valle de Choquecota, Cord. Quimza Cruz, Bolivia, *Herzog* 2340.

RANGE: High mountains of central Peru south to the Bolivian Plateau.

PERU. Junin: Hacienda Arapa near Yauli, 4400 m. alt., 1902, *Weberbauer* 290 (BD, basis of Weberbauer's illustration!); Oroya, 4300 m. alt., 1903, *Weberbauer* 2620 (BD); Alpamina Mines, 1904, *Weberbauer* 5111 (BD); Cerro de Pasco, ca. 4200 m. alt., 1923, *Macbride* 3066 (FM); Huasa Huasi, 1779, *Dombey* (Paris, type). Apurimac: crest of Socollaccas Pass, 4000 m. alt., open puna among grass, fl. lavender, Nov. 11, 1935, *West* 3829 (UC). Cuzco: La Raya, ca. 4300 m. alt., 1925, *Pennell* 13526 (FM.)

BOLIVIA. La Paz: Huaycho to Molo, 4200 m. alt., 1903, *Hill* 123 (K); Sorata, 3900 m. alt., Feb. 1886, *Rusby* 1925 (NY); near Sorata, 3800 m. alt., Nov. 1857, *Mandon* 713 (G, K, BM, BD, Boiss, Del, Paris); hills above Ancoraimas, 4050 m. alt., 1904, *Hill* 124 (K); near top of Huallata Pass, 4233 m. alt., *Conway* 39 (K); Corocoro, 4400 m. alt., Feb. 16, 1921, *Asplund* 2487 (Upsala); Palca to La Paz, 4200–4700 m. alt., *Pflanz* 136 and 226 (BD); La Paz to Palca and Illimani, 3600–4800 m. alt., *Hauthal* 317 and 325 (BD); Laguna la Apacheta, Illimani, 4670 m. alt., *Stübel* 24a and 29a (BD); Cord. Quimza Cruz, valley of the Choquecota, 4300 m. alt., Oct. 1911, *Herzog* 2340 (BD, type of *A. Herzogii*). Oruro: Cord. de Azanaque, 4400 m. alt., Dec. 26, 1926, *Troll* 2995 (BD). Chuquisaca: Cuesta de Periguani between Pomabamba and Comargo, prov. Cinti, Jan. 11–13, 1846, *Weddell* 3934 (Paris). Cochabamba: Cord. de la Llave, prov. Ayopaya, 4000 m. alt., Dec. 1846, *Weddell* 4137 and 4138 (Paris). Indefinite: *Bang* 1792 (G) and 1879 (G, NY, US).

A low caespitose plant of high altitudes with glabrous herbage and large, usually brightly colored reddish purple flowers. Collectors, attracted only by its conspicuous flowers, have failed to collect the fruit of this species. Among all the collections examined only three (*Asplund* 2487, *Bang* 1879 and *Rusby* 1925) show the fruit. The legume is a remarkable one. It is glabrous, rugulose and completely 2-celled with a coarse septum almost as tough and firm as the valves, and is rigidly inflated and dorsi-ventrally somewhat compressed so that measurements across it about equal those for its total length and exceed its dorsi-ventral measurements. Hence it becomes 4–9 mm. long and thick and only about 3–7 mm. high. Viewed from below the legume appears didymous, being obtuse or rounded at the base, broadly retuse at the apex, and having a narrow deeply inflexed lower suture. The valves are flattened on the back and sides and

hence are somewhat rectangular. The flowers are solitary on peduncles that become 5–10 mm. long in fruit. The pedicels are 1–2 mm. long. The calyx-tube is elongate.

The species is best known from the department of La Paz in Bolivia. This Bolivian plant, of which a form has been described as *A. Herzogii*, is clearly conspecific with the original *A. uniflorus* of the western Andes of Peru. The collection at Paris labeled "in altis et frigidis, Huasa-Huasi, 1779, Dombey," is apparently the basis for the plate, as well as for the description originally given by De Candolle. The species is a very distinct one and is readily recognized.

62. *Astragalus Venturii*, sp. nov.

Planta perennis caespitosa; ramis 2–4 mm. crassis stipulis ocreaceis aureis strictis obtectis e caudice horizontali laxe ramoso orientibus; ramis foliatis perbrevibus 5–10 mm. longis, internodiis stipulis brevioribus; foliis vix numerosis ascendentibus, rhachi 6–20 mm. longa, foliolis saepe 2–3 (rariter 4-) jugatis 2–7 mm. longis 2–3 mm. latis oblanceolatis pilos adpressos vix abundantes strigosos non rariter subflaventes gerentibus; pedunculo laxe 1–2-flori 3–12 mm. longo; pedicello 1–2 mm. longo; calycibus 4–5 mm. longis sparse strigosis pilos nigrescentes non rariter gerentibus, lobis subulatis 1–2 mm. longis saepe nigro-strigosis; vexillo ca. 7 mm. longo (lamina 5–6 mm. lata) quam carina 3 mm. et alis 1 mm. longiore; ovario glabro; leguminibus glabris compressis unilocularibus (vix septatis) margine inferiore saepe plus minusve inflexis, valvulis 4–7 mm. longis et 2.5–5 mm. latis.

ARGENTINA. Jujuy: Tilcara, 3200 m. alt., fl. blue, Feb. 1927, *Venturi* 7417 (type, U. S. Nat. Herb.); Tilcara, 3200 m. alt., Feb. 1927, *Venturi* 7411 (US); Cerro La Solidar, dept. Humahuaca, 3500 m. alt., fl. blue, Jan. 1927, *Venturi* 9018 (G, US). Salta: Cerro de Cachi, fl. bluish, March 1927, *Venturi* 6674 (US); Cerro de Cachi, 4400 m. alt., fl. violet, March 1927, *Venturi* 6691 (US). Tucuman: Sierra del Cajon, dept. Tafi, 3500 m. alt., fl. violet, May 1926, *Venturi* 7609 (US). Catamarca: Sierra del Anconquija, dept. Santa Maria, 4600 m. alt., fl. violet, Jan. 1926, *Venturi* 7605 (US).

The relationship of this plant is uncertain. Among the caespitose species of northwestern Argentina it is quickly distinguished by the yellowish green color imparted to the plant by the yellowish stipules that ensheathe the caudex and, partially, by the yellowish hairs on the herbage. The only species readily confused with the species is *A. Burkartii*. The available material is not fully mature and is inadequate for the proper description of its fruiting structures. The immature legumes are variable, some appearing to have both sutures prominent while others have the lower suture strongly intruded.

63. *Astragalus confinis*, sp. nov.

Planta perennis caespitosa; ramulis caudicis paucis gracilibus horizontalibus 1–2 mm. crassis; ramulis foliatis 5–12 mm. longis paucis dense albo-strigosis, internodiis 2–5 mm. longis; foliis pallide strigosis, rhachi 2–5 mm. longa, foliolis 2–4-jugatis oblongi-linearibus 3–10 mm. longis 1–2 mm. latis margine involutis, stipulis 2–4 mm. longis strigosis laxae vel vix imbricatis; pedunculis 1–4 cm. longis apice 2–5-floris; pedicellis 1 mm.

longis; vexillo 6–7 mm. longo (lamina 3–4 mm. lata) quam carina obtusa ca. 2.5 mm. et quam alis 1 mm. longioribus; calyce 3–4 mm. longo pallide strigoso, lobis triangulari-lanceolatis 1–1.5 mm. longis; ovario glabro; leguminibus glabris ca. 8 mm. longis 3–4 mm. latis margine inferiori inflexis, septo membranaceo angustissimo inconspicue.

PERU. Arequipa: near Arequipa, 2000–2500 m. alt., Feb. 13, 1923, *Guenther & Buchtien 1082* (Hamb); Arequipa, 2300 m. alt., Feb. 11, 1923, *Guenther & Buchtien 1081* (type, Hamburg).

CHILE. Tarapaca: between Pachica and Aico, 2400 m. alt., April 15, 1927, *Troll 3305* (BD).

A species evidently related to *A. hypsogenus* of northwestern Argentina and adjacent Bolivia from which it differs sharply in its fewer leaflets, sparser indument, slightly smaller flowers, and glabrous ovary and fruit. Furthermore, the leafy stems seem to be more elongate than in its southern relative. Except for the rudimentary septum and lack of hairs, the fruit of *A. confinis* is very similar to that of its relative.

64. *Astragalus hypsogenus*, sp. nov.

Planta caespitosa; caudice gracili saepe laxe longeque ramoso, ramulis 1–2 mm. crassis cum stipulis 3–6 mm. longis imbricatis sparse strigosis vestitis; foliis pallide strigosis saepe sericeis sed non rariter subglabrescentibus, rhachi 2–5 cm. longa, foliolis lanceolatis vel oblongis plicatis vel margine involutis 3–17 mm. longis 2–3 mm. latis 4–7-jugatis distantibus apice acutis; pedunculis 2–6 cm. longis apice 2–10-floris; pedicellis 1–2 mm. longis; calyce ca. 5 mm. longe strigoso pilis non rariter nigris vestito, lobis 1–2 mm. longis; vexillo 8–10 mm. longo (lamina 4–6 mm. lata apice emarginata) quam carina 3–4 mm. et quam alis angustis 1 mm. longiore; leguminibus saepe sublunatis strigosis 10–15 mm. longis 3–5 mm. altis margine inferiore plus minusve introflexis margine superiore a latere viso plus minusve leviter concavis, septo nullo.

BOLIVIA. Potosi: Atocha, 3700 m. alt., March 19, 1921, *Asplund 6135* (US) and 2974 (Upsala).

ARGENTINA. Jujuy: Esquina Blanca, Feb. 13, 1921, *Castellanos 32* (G); Cerro Incahuasi, dept. Cochínoca, 4500 m. alt., fl. light blue, 1930, *Venturi 10126* (type, Gray Herb.; isotypes, US, BM, Stock); Laguna Tres Cruces, *Claren 11695* (Stock); Moreno, 3800 m. alt., 1901, *Fries 821a* (Stock); Abra del Palamar, 3600 m. alt., 1901, *Fries 821* (Stock); Sierra del Aguila, 3700 m. alt., fl. bluish, 1929, *Venturi 8694* (US); Santa Catalina, 3650 m. alt., *Claren 11442* (Stock). Los Andes: Chorrillos, March, 1930, *Budin 12* (G); San Antonio de los Cobres, Feb. 25, 1927, *Castellanos 27/823* (G). Salta: Punta Cienega, Queb. del Toro, 3350 m. alt., Feb. 1932, *Keidel 4* (LP); Cerro de Cachi, 4000 m. alt., fl. bluish, March 1927, *Venturi 6675* (US). Tucuman: between Estan. Santa Rosa and La Cueva, dept. Chichigasta, 3600 m. alt., fl. violaceous, Jan. 1926, *Venturi 7606* (US).

A very distinct species with evident relationships only with *A. confinis* and *A. crymophilus*. Among the species of northwestern Argentina it is readily recognized by its tufts of silvery strigose leaves and its pedunculate subumbellate cluster of flowers. In general appearance the fruit of *A. hypsogenus* is suggestive of a small fruit of *A. arequipensis*. The upper edge is somewhat concave in lateral outline and the apex is acute. The lower part of the fruit is either flattened or inflexed. There is no false septum developed within the pod. Among the collections cited above

those by Fries and by Claren have been identified by Fries, *Nova Acta R. Soc. Sci. Upsala ser. IV*, 1¹: 135-36 (1904), as *A. modestus* and *A. bellus*.

65. *Astragalus crymophilus*, sp. nov.

Planta caespitosa; caudice denso breviter ascendenterque congesti-ramoso; ramulis caudicis 3-10 mm. longis stipulis glabris membranaceis imbricatis dense vestitis; foliis argenteis dense sericeo-strigosis, rhachi 2-5 mm. longa infra medium nuda, foliolis 2-3-jugatis linearibus plicatis distantibus 8-19 mm. longis 1-2 mm. latis; pedunculo 2-15 mm. longo sericeo-strigoso apice 2-6-flore; pedicellis 0.5-1 mm. longis; calycibus 2.5-3 mm. longis sericeo-strigosis, lobis ca. 1 mm. longis linearibus vel lanceolatis tubo campanulato subaequilongis; vexillo 5-6 mm. longo, lamina 2-3 mm. lata obovata apice emarginata quam alis angustis 1 mm. et quam carina obtusa 2 mm. longiori; ovario albiters strigoso; legumine oblongo compresso strigoso 6-8 mm. longo 2-4 mm. alto 1-2 mm. crasso, margine superiori a latere viso recto vel leviter convexo, margine inferiori valde introflexo, septo interiore membranaceo angusto 0-0.5 mm. alto inconspicuo; ovulis 10-12.

BOLIVIA: Uyuni, dept. Potosi, 3700 m. alt., March 1923, *Asplund 6134* (type, U. S. Nat. Herb.) and *3148* (Upsala); Puna Patanca, dept. Tarija, 3800 m. alt., March 27, 1904, *Fiebrig 2912* (G, US, K, BM, BD).

ARGENTINA: Mina Perdida, dept. S. Catalina, Jujuy, 4100 m. alt., Jan. 25-26, 1901, *Claren 11499* in pt. (Stock).

A well marked species most closely related to *A. hypsogenus*, from which it differs in its denser more silvery indument, fewer linear leaflets, oblong rather than lunate pods and narrow but definite false septum within the fruit. The collection from Jujuy consists of a single plant mixed with a reduced form of *A. micranthellus*. Fries determined and reported the collection as *A. modestus*.

66. *Astragalus pusillus* Vogel, Verhandl. K. Leop.-Carol. Akad. Naturf. 19: suppl. 19 (1843); Weddell, Chlor. Andina 2: 259 (1861).—Type from Alto de Toledo, Peru, *Meyen*.

RANGE: High altitudes from southern Peru southward across the Bolivian plateau to the mountains of northwestern Argentina.

PERU. Puno: Poto, prov. Sandia, 4500 m. alt., 1902, *Weberbauer 993* (BD); cordilleras near lake Ayapata, *Lechler 1730* (K); Azangaro, June 1854, *Lechler 3242* (K); Crucero, 1920, *Stordy* (K); Pucará, 3700 m. alt., *Weberbauer 438* and *440a* (BD); Moho, 1848, *Weddell 4414* (Paris). Arequipa: above Chivay, prov. Caylloma, 4200 m. alt., 1914, *Weberbauer 6896* (BD, FM); Alto de Toledo, 4650 m. alt., 1831, *Meyen* (BD, type); near Arequipa, 2200-2500 m. alt., 1923, *Guenther & Buchtien 1114*, *1117*, *1118* and *1120* (Hamb). Moquegua: Coalaque near Lagunillas, 4400 m. alt., 1923, *Guenther & Buchtien 1866* (Hamb).

CHILE. Arica: Cord. de Volcan Tocora, Ancara, 4300 m. alt., *Werdermann 1128* (G, BD, US).

BOLIVIA. La Paz: Achachachi, Ancorairnes and Guatata, 4000-4200 m. alt., 1857-58, *Mandon 712* (G, K, BM, BD, Del, Paris, Stock); La Paz, 4100 m. alt., *Buchtien 64/624* (K, BD, US); Lancha, between La Paz and Coroica, 5000 m. alt., *Mandon 718* (K); La Lancha, Canyon of the Chuquiagillo, 1851, *Weddell* (Paris); Cerro Quimsachata, 13 km. s. of Tiaguanaco, 4200 m. alt., *West 6379* (UC); Challa-velina, Feb. 9, 1927, *Troll 3055* (BD); Ulloma, 3900 m. alt., Feb. 2, 1927, *Troll 3119*

(BD); Ulloma, 3850 m. alt., Feb. 21, 1921, *Asplund 4423* (Upsala); Mina La Union, 4400 m. alt., May 4, 1927, *Troll 1939* (BD); Charaña, 4000 m. alt., March 1, 1921, *Asplund 6143* (US) and 2671 in pt. (Upsala); Corocoro, 4300 m. alt., Feb. 16, 1921, *Asplund 2485* (Upsala), Calacoto, 3800 m. alt., March 7, 1921, *Asplund 4432* (Upsala). Potosi: Totorapalca, prov. Linares, 3400 m. alt., 1934, *Hammarlund 426* (Stock); Potosi, 4000 m. alt., 1932-33, *Cardenas 165* (G) and 466 (US). Indefinite; near Coldero, Andes of Pelechuco, 4800 m. alt., April 1865, *Pearce* (BM); prov. de Carangas, Bolivia, *d'Orbigny 1438* (Paris).

ARGENTINA. Salto: Los Potrereros, south of Nevado del Castillo, March 1873, *Hieronymus & Lorentz 56* (BD, K, FM).

Bolivian material of this well marked species has been frequently confused with *A. peruvianus*. The latter, however, is readily distinguished by its smaller fruit, its persistent silvery indument, its narrow acute to rounded leaflets, and its usually firm tight yellowish stipular sheaths that commonly form an evident collar about the leaf-rosette. The real relationships of our present species, however, seem to be with the habitally dissimilar *A. arequipensis*. Its sparsely villous pods are ca. 5 mm. long and 3 mm. broad. The lower suture is inflexed and there is a false septum. One of the most distinctive developments of *A. pusillus* is its compacted inflorescence. Terminating the branches of the multicipital caudex and nestling in the center of the rosette of rather coarse leaves, sessile flowers are to be found intermixed with bracts and broad white papery stipular-sheaths. The foliage is villous becoming glabrescent in age. The indument is not lustrous. The leaflets are oblong to obcordate, retuse, and 2-5 mm. broad. The plant is one of the peculiar habit-types characteristic of the Bolivian altiplano.

The only Argentine material I have seen comes from southern Salta. Hosseus, Bol. Acad. Nac. Cien. Cordoba 26: 154, fig. 27 (1922), however, reports *A. pusillus* from the Sierra Famatina, La Rioja, on the basis of six collections which he compared and found conspecific with the material obtained in Salta by Lorentz & Hieronymus (no. 56).

67. *Astragalus Urbanianus* Ulbrich, Bot. Jahrb. 37: 422 (1906); Fiebrig, Bot. Jahrb. 45: 12 (1910). — Type from Calderillo, southern Bolivia, *Fiebrig 3184a*.

BOLIVIA. La Paz: Charaña, 4050 m. alt., March 1, 1921, *Asplund 2671* in pt., mixed with *A. pusilla* (Upsala). Potosi: Potosi, 4000 m. alt., March 1932, *Cardenas 165*, mixed with *A. pusilla* (G). Tarija: Calderillo, 3600 m. alt., March 1904, *Fiebrig 3184a* (BD, type; US, FM); southern Bolivia, 1903, *Fiebrig 3576* (BD).

Very evidently related to *A. peruvianus*, and perhaps only a luxuriant form of that species. From its relative it differs in having, not 1 or 2, but 4-7 flowers clustered in an exceedingly abbreviated subumbellate axillary raceme. The flowers are intermixed with broadly lanceolate bracts. These bracts permit the plant to be distinguished from those forms of *A. peruvianus* which produce several flowers on a given branch of the caudex, for in the latter cases the flowers are separated, not by bracts, but by leaves and stipules. The leaves in *A. Urbanianus* are larger than in *A. peruvianus*, the lanceolate to oblong blade measuring 3-12 mm. and the leaf-rachis 1-5 cm. in length.

68. *Astragalus Dillinghami* Macbride, Pub. Field Mus. Bot. 8: 98 (1930), and l.c. 13 [Fl. Peru 3:]: 396 (1943).—Type from between Tarma and Morocochó, Macbride & Featherstone 1052.

PERU. Near Tarma, Junin, 4200 m. alt., June 1922, Macbride & Featherstone 1052 (FM, type).

The type has no fruit. The flowers are in a much shortened raceme and form a cluster among the leaves. The leaves are abundantly villous with loosely appressed silky hairs about 2 mm. long. The plant is evidently related to *A. Urbanianus* but differs in the more abundant and longer hairs of its indument. It may not be specifically distinct.

69. *Astragalus peruvianus* Vogel, Verhandl. K. Leop.-Carol. Akad. Naturfors., 19: suppl. 18 (1843).—Type collected near Pisacoma in southern Peru, Meyen.

RANGE: High altitudes in southern Peru, Bolivia and northwestern Argentina.

PERU. Ayacucho?: Santa Inez silver mines (between Ayacucho and Pisco), May 1910, Weberbauer 5450 (FM, BD). Moquegua: Carumas near Volcan Ticsani, 1925, Weberbauer 7327 (FM, BD). Tacna: near Pisacoma, 4500 m. alt., 1831, Meyen (BD, type).

BOLIVIA. La Paz: La Cumbre, trail to the Yungas, ca. 4700 m. alt., March 28, 1921, Asplund 6130 (US) and 3846 (Upsala); Chacaltaya, 4800 m. alt., 1908, Buchtien 1813 (US, BD); near La Paz, 3000 m. alt., 1890, Bang 660 (G, NY). Potosi: Cerro de Potosi, 4800 m. alt., Feb. 1933, Cardenas 406 in pt. (US); Potosi, 4000 m. alt., 1936, Cardenas 600 (G).

ARGENTINA. Tucuman: Cumbre de Calchaquies, 4200 m. alt., Spegazzini 2104 (LP); El Pelado, 1912, Rodriguez 442 (G).

Typical *A. peruvianus* usually has the coarse elongate branches of the caudex tightly ensheathed with glabrous tough commonly stramineous stipules. The leaves, with abundant appressed lustrous hairs, are usually small having leaflets mostly 1 mm. or rarely 2 (–2.5) mm. long on rachises 5–10 (–15) mm. long. The solitary (or rarely geminate) flowers are borne among the stipules of the functioning leaves. The species is closely related only to *A. Urbanianus* and *A. Dillinghami*, both of which have larger leaves and abbreviated racemes of flowers. Some forms of *A. peruvianus* suggest *A. diminutivus* in gross habit but these forms may be distinguished from that species by their very different fruit, lustrous more appressed indument, glabrous stipules, etc. Our present plant has been most frequently confused with *A. pusillus*, but that plant has non-lustrous indument, broader emarginate leaflets, much broader papery stipules, and clustered flowers.

Besides the specimens cited above I have in my notes thirteen other collections assigned to *A. peruvianus*. They represent collections identified before I had recognized *A. Urbanianus* as distinct from *A. peruvianus*, and some of them may possibly represent the former species. Those from Peru are, from near Arequipa, 2000–2500 m. alt., 1923, Guenther & Buchtien 1077, 1353, 1354, and 1355 (Hamb); Saracocha near Lagunillas, 4400 m. alt., 1925, Guenther & Buchtien 1164b (Hamb), and those from Bolivia are, from Rinconada, Yungas Pass, northeast of La Paz, 4100 m. alt., 1928, Troll 1891 (BD); Chuyuncayani, 1851, Weddell (Paris); Chacaltaya, northeast of La Paz, 1928, Troll 1935 (BD); La Lancha near

La Paz, 5000 m. alt., *Mandon* 718 (K, Del); Huari pampa, between La Paz and Palca, 4200–4400 m. alt., 1910, *Pflanz* 483 in pt. (BD); Quemsachata near Tiahuanaco, 4300 m. alt. 1877, *Stübel* 64 (BD); Copacabana, 4050 m. alt. 1903, *Hill* 122 (K); and Quebrada Honda, Potosi, *d'Orbigny* 1310 (Paris).

70. *Astragalus Werdermanni*, sp. nov.

Planta dense caespitosa; ramulis caudicis congestis stricte ramosis, vetustioribus stipulis imbricatis membranaceis pallidis dense vestitis; foliis cinereis sparse breviterque strigosis, rhachi 13–18 mm. longa supra medium foliolata, foliolis 5–7-jugatis orbiculato-obcordatis evidenter plicatis 2–2.5 mm. longis 2–3 mm. latis paulo supra medium latioribus apice conspicue emarginatis basi rotundatis sparse strigosis pilis a costa oblique abeuntibus; stipulis 3–4 mm. longis strictis sparse strigosis; pedunculis 1–2-floris, fructiferis 3–7 mm. longis; pedicellis 0.5–1 mm. longis; calycibus sparse strigosis ca. 2.5 mm. longis, tubo membranaceo cupulato, lobis triangularibus ca. 0.5 mm. longis viridibus; corolla ignota; leguminibus subbilocularibus sparse strigosis 5–7 mm. longis 2–3 mm. crassis 3–4 mm. altis, margine superiori a latere viso recto, margine inferiore a latere viso valde convexo, sutura inferiore valde inflexa in loculo leguminis septum membranaceum 2–3 mm. altum gerente; seminibus pluribus.

CHILE: Chislluma, Cord. Volcan Tacora, Arica, depressed, a few plants between rocks, 4500 m. alt., April 1926, *Werdermann* 1439 (type, Berlin).

A well marked species probably most closely related to *A. casapaltensis* Ball, Jour. Linn. Soc. London 22: 36 (1885), a species known only from high altitudes in central Peru (cordilleras of Lima and Junin), which differs from our present plant in its fewer, more conspicuously emarginate leaflets that bear more persistent and more appressed shorter hairs. The proposed Chilean species is readily recognized by its very broadly obcordate, strongly folded leaflets which are strigose with numerous scattered closely appressed hairs oriented obliquely to the midrib. The fruit has a very well developed, almost complete, membranous false septum.

71. *Astragalus minutissimus* Weddell, Chlor. Andina 2: 257 (1861).—Type from "dept. Cuzco," *Gay* 629.

PERU. Cuzco: "dept. Cuzco," *Gay* 629 (Paris, type). Puno: Mullapata near Moho, 3125 m. alt., 1919, *Shepard* 110 (G, NY, US); between Huaicho and Moho, 1903, *Hill* 126 (K).

BOLIVIA: La Paz: Isla del Sol, Lake Titicaca, 3840 m. alt., March 1910, *Buchtien* (US). Cochabamba: Challa Pass, 4500 m. alt., March 17, 1892, *Kuntze* (NY).

This species is very closely related to *A. alpamarcae* Gray, U. S. Explor. Exped. 1: 417 (1854), which is known only from a few collections in the cordillera of central Peru (Cerro de Pascò, Junin, *Mathews* 924; Alpamarca, Lima, U. S. Explor. Exped., type; and Casapalca, Lima, *Macbride & Featherstone* 837). The plants of the northern, older species have 7–9 pairs of leaflets. The leaves in our present southern form bear only 3–5 pairs of leaflets. Otherwise the plants seem very similar. The differences between *A. minutissimus* and *A. alpamarcae* are probably not of

specific value. Certainly the two are very much alike in general appearance. In gross aspect *A. minutissimus* is frequently very similar to *A. deminutivus*. The fruits of these species, however, are very different, and furthermore the leaflets of *A. minutissimus* show a very much stronger tendency towards glabrescence than do those of *A. deminutivus*.

72. *Astragalus minimus* Vogel, Verhandl. K. Leop.-Carol. Akad. Naturfors. 19: suppl. 18 (1843).—Type from Alto de Toledo, east of Arequipa, *Meyen*.

Astragalus colliculus Rusby, Mem. Torrey Bot. Club 3: 19 (1893).—Type from near La Paz, *Bang* 660.

PERU. Arequipa: Alto de Toledo, 4600 m. alt., *Meyen* (BD, type).

BOLIVIA. La Paz: near La Paz, 3000 m. alt., *Bang* 660 (NY, type of *A. colliculus*); Charaña, 4000 m. alt., March 1, 1921, *Asplund* 6145 (US) and 2672 (Upsala).

CHILE. Arica: Ancara, Cord. Volcan Tacora, 4300 m. alt., April 1926, *Werdermann* 1136 (G, BD).

ARGENTINA. Jujuy: Moreno, 3500 m. alt., Dec. 14, 1901, *Fries* 916 (Stock). Los Andes: San Antonio de los Cobres, Feb. 21, 1927, *Castellanos* 27/813 (G). Tucuman: between La Puerta and Los Cardones, Cumbre Calchaquies, 4400 m. alt., Jan. 30, 1933, *Burkart* 5386 (Burkart).

This species is closely related to *A. minutissimus* and *A. alpamarcae*, but has a more prostrate habit and an indument of shorter much more appressed hairs. In gross habit it much resembles *A. Bustillosii* which differs in its rhizomes, larger flowers, and much larger compressed fruit. As in *A. Bustillosii*, our present species frequently has the fruit elevated on a short but definite 1–2-flowered peduncle 2–6 mm. long.

The type specimen of *A. colliculus*, *Bang* 660 at New York, represents two forms of the present species. *Bang*'s collection was evidently a great mixture, for in addition to the two forms of *A. minimus* at New York, material of *A. peruvianus* and of a depauperate form of *A. arequipensis* has been distributed under his no. 660 to other herbaria. *Rusby*'s description of *A. colliculus* seems to include details derived from the material of all the species mentioned. To make matters worse, *Mandon* 712 at New York, which was cited by *Rusby*, is also a mixture consisting of plants of *A. pusillus* and *A. minutissimus*. If *Rusby*'s species is not to be discarded as a confused mixture, it must be taken as a synonym of *A. minimus* since the material of *Bang* 660 retained at New York by *Rusby* all belongs to that species.

73. *Astragalus pulviniformis* Johnston, Physis 9: 309 (1929).—Type collected at Vega Cadillo in northwestern San Juan, Argentina, *Johnston* 6128.

ARGENTINA. Vega Cadillo, Rio Tagua, San Juan, 3000 m. alt., 1926, *Johnston* 6128 (G, type; K, Paris, Stock).

A very well marked species which has its closest relations in *A. Reichei* and *A. deminutivus*. Its dense pulvinate habit, strongly marcescent dusky leaves, scattered hyaline stipules, slender elongating stems, and larger fruit readily distinguish it from the species mentioned.

74. *Astragalus Reichei* Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 264 (1902). *Phaca compacta* Phil. Cat. Pl. Itin. Tarapaca 14 (1891).—Type from Queb.

Machuca, prov. Antofagasta, 3200 m. alt., *Philippi*.

Astragalus compactus (Phil.) Reiche, Anal. Univ. Chile 97: 539 (1897), and Fl. Chile 2: 82 (1898).—Not Lam. (1789).

BOLIVIA. Rosario, prov. Pacajes, dept. La Paz, 3750 m. alt., 1920, *Shepard* 227 (G); above Animas Mine, west of Chocaya, dept. Potosi, 4250 m. alt., *West* 6069 and 6070 (G).

CHILE. Peña Blanca, Cord. Arr. Coyacagra, prov. Tarapaca, 4000 m. alt., *Werdermann* 1117 (G, K, BD); Atacama Desert [Queb. Machuca, prov. Antofagasta, 3200 m. alt.], ex *Philippi* as *P. compacta* (K, BD).

This species has close relationship only with the more easterly and southerly ranging *A. flavocreatus*. The short simple or strictly branched stems are erect or ascending from the crown of the deep root. They are covered with the leaves of seasons past and crowded to form a dense mass commonly intermixed with some dirt. The stipules of *A. Reichei* are pale and are not so firm nor so closely appressed to the stem as are those of *A. flavocreatus*. The herbage of *A. Reichei* is slightly more grayish than in its relative.

75. *Astragalus flavocreatus*, sp. nov.

Planta perennis e radice profunda recta oriens; caudice saepe laxe ramoso plus minusve horizontali, ramulis funiculiformis gracilibus 1–1.5 mm. crassis stipulis stramineis strictis imbricatis vestitis vestigiis foliorum haud gerentibus; foliis apice ramulorum stipulorum caudicis aggregatis pilis haud abundantibus (0.2–0.6 mm. longis rectis adpressis) vestitis vetuste deciduis; rhachi 5–15 mm. longa tertiam partem inferiorem efoliolata; foliolis 0.5–1.5 mm. longis obovatis vel ellipticis saepe subplicatis supra subglabris apice rotundis vel subemarginatis; stipulis stramineis ocreatis opacis internodiis ramuli subaequilongis vel longioribus persistentibus 2–4 mm. longis juventate laxe et vetuste stricte vaginatis dorse saepissime glaberrimis margine apicem versus ciliatis; pedunculis perinconspicuis inter stipulis occultis 1–2 mm. longis; floribus solitariis; calyce 2–3 mm. longo haud vel vix pedicellato imam ad basim per bracteam 1–2 mm. longam strictam suffulto, tubo cupulato pilis sparsis adpressis vestito, lobis angustis ca. 0.5 mm. longis breviter villosis; corolla violacea, vexillo 6–7 mm. longo, lamina suborbiculari ca. 5 mm. diametro apice emarginata; carina obtusa quam vexillo ca. 3 mm. brevior; alis 4–5 mm. longis supra medium ut videtur patentibus; leguminibus subglobosis ca. 2 mm. longis villosis unilocularibus biseminatis, sutura inferiore inflexa.

BOLIVIA. Cerro de Potosi, 4800 m. alt., 1933, *Cardenas* 406 (G) and 406 in pt. (US); Potosi, 4000 m. alt., 1932, *Cardenas* 166 (G).

ARGENTINA. Salta: Cerro de Cachi, 4000 m. alt., 1927, *Venturi* 6704 (US). Catamarca: Sierra Anconquija, 4200–4600 m. alt., *Venturi* 6626 and 6627 (US). Tucuman: Cumbre Calchaquies, dept. Tafi, between La Puerta and Los Cardones, 4400 m. alt., Jan. 30, 1933, *Burkart* 5385 (type, Gray Herb.); Est. Santa Rosa, dept. Chidigasta, 3600 m. alt., 1924, *Venturi* 6625 (US). La Rioja: Alto Blanco, Sierra Famatina, 1928, *Castillanos* 28/182 (G).

This plant is evidently related to *A. Reichei*, but its habit of growth, as well as various intangibles of pubescence, stipules, etc., permit it to be distinguished from that species. The caudex of *A. Reichii* is a compacted mass of strictly ascending stems and persistent old leaves. It is very different from the more spreading superficial caudex of leafless rope-like stems developed by *A. flavocreatus*. The tightly ensheathing straw-

colored stipules which clothe its more elongate and loosely branched stems, and the general lack of persistent old leaves, make *A. flavocreatus* a more neat and attractive plant and permit it to be quickly distinguished from other caespitose species. The flowers of *A. flavocreatus* have a bract tightly appressed about one side of the calyx. This is the bract borne at the apex of the reduced peduncle. From its axil the solitary flower is produced. The calyx is sessile. The apparent pedicel, accordingly, is really the reduced peduncle. This pedicel-like peduncle in *A. flavocreatus* is usually twice the length of that found in *A. Reichei*. It is usually well hidden in the stipular sheathes.

76. *Astragalus diminutivus*, sp. nov.

Planta multiceps cinerea dense caespitosa 2–15 cm. diametro; ramulis caudicis cum stipulis et reliquiis conspicuis congestis foliorum abundanter vestitis; foliis villosulis numerosis diminutivis, rhachi 1–2 cm. longa tertiam partem inferiorem efoliolata; foliolis 5–7-jugatis orbicularibus vel anguste ovatis saepe ca. 1 mm. longis margine laxe involutis apice rotundis; stipulis vaginatis amplis chartaceis albidis villosulo-strigosis valde imbricatis saepe 4–5 mm. longis; floribus axillaribus solitariis subsessilibus; calycibus 3–5 mm. longis villosis imam ad basim bracteam lanceolatam gerentibus, tubo chartaceo profundo, lobis linearibus herbaceis 1–1.5 mm. longis; vexillo corollae coruleo 7–8 mm. longo quam carina 2–3 mm. longiori, lamina 3–4 mm. lata apice emarginata; alis caeruleis quam carina pallida obtusa 1–1.5 mm. longioribus supra medium ut videtur patentibus; ovario strigoso; leguminibus oblique subglobosis ca. 2 mm. longis et 1.5 mm. crassis subtus introflexis; seminibus 1–2 saepe 2 mm. diametro.

BOLIVIA. La Paz: General Campero, 3900–4200 m. alt., March 5, 1921, *Asplund* 6140 (US) and 2780 (Upsala). Potosi: Cerro de Potosi, 4800 m. alt., 1933, *Cardenas* 406 in pt. (US); Uyuni, 3700 m. alt., March 24, 1921, *Asplund* 6141 (US) and 3138 (Upsala); Rio Mulalo, prov. Porco, 1934, *Hammarlund* 464 (Stock). Tarija: Puna Patanca, 3700 m. alt., 1904, *Fiebrig* 2608 (type, Gray Herb.; K, BD, Paris).

ARGENTINA. Los Andes: Susquis, March 7, 1927, *Castellanos* 27/818 (G). Jujuy: Laguna Tres Cruces, 1901, *Claren* 11657 (Stock).

The specimens I have cited above are certainly conspecific and merit description as a new species. They include the plant incorrectly called *A. Reichei* by Fries, Nova Acta R. Soc. Sci. Upsala ser. IV, 1¹: 134 (1905). Hosseus, Bol. Acad. Nac. Cordoba 26: 154, fig. 28 (1922), has given an illustration of *Claren* 11657, which is the basis of Fries' note, and properly expresses a doubt as to the correctness of Fries' identification.

Closely related to *A. diminutivus* and perhaps only a robust form of this species are two collections made in the dept. of Potosi by *Asplund*. These collections are, — Uyuni, 3700 m. alt., March 24, 1921, *Asplund* 6139 (US) and 3137 (Upsala), and Atocha, 3700 m. alt., March 20, 1921, *Asplund* 6138 (US) and 3025 (Upsala). They differ from typical *A. diminutivus* in having the pods more elongate and larger (oblong and 3–5 mm. long), the seeds smaller (1.3–1.5 mm. broad) and more numerous (3–6), the leaves larger (rhachis ca. 3 cm.), and the leaflets larger (1–2 mm.) and somewhat elongate. On Cerro de Chani, Jujuy, Argentina,

Venturi (no. 8527, US) has obtained still another form which is tentatively placed under *A. deminutivus*. This form has glabrous stipules.

77. *Astragalus Dielsii* Macbride, Field Mus. Pub. Bot. 11: 24 (1931), and l.c. 13 [Fl. Peru 3:]: 396 (1943).—Type from Yanashallos, west of Huallanca, dept. Ancash, *Macbride & Featherstone* 2479.

PERU. Yanashallas, Ancash, 4800 m. alt., Oct. 2, 1922, *Macbride & Featherstone* 2479 (FM, type; BD); mountains west of Oroya, 4300 m. alt., Nov. 23, 1902, *Weberbauer* 1704 (FM, BD).

This is an outlying northern relative of *A. deminutivus*. Its stipules are conspicuously and permanently strigose, and though white at first soon become very dusky in color.

UNPLACED SPECIES

Astragalus Cuatrecasii Macbride, *Candollea* 7: 221 (1937), and Pub. Field Mus. Bot. 13 [Fl. Peru 3:]: 394 (1943).—Peru, *Ruiz & Pavon*.

Based upon a flowering specimen at Madrid said to have been collected somewhere in Peru by Ruiz & Pavon. Among the notable features of the type are the numerous leaflets (9–12 pairs), the black appressed hairs on its calyx, and the rather elongate stems and accordingly laxly caespitose habit. It appears to be a relative of *A. minimus* Vogel and is, perhaps, even a form of that species. Lacking fruit, however, its identity remains uncertain.

Phaca diminutiva Philippi, Cat. Pl. Itin. Tarapaca 14 (1891).—"Inter Aguas calientes et Socaire. . . lecta"; not *A. deminutiva* Johnston.

A very small caespitose plant with pallid appressed indument. The single specimen was collected with the type of *Phaca cryptantha* Phil. Reiche, Fl. Chile 2: 80 (1898), places both *P. cryptantha* and *P. diminutiva* as synonyms of *A. clandestinus* (Phil.) Hieron. which is called *A. cryptobotrys* in this paper. This is perhaps correct. In any case the name may be discarded since the trivial epithet is preoccupied under *Astragalus*. Prof. Espinosa could not locate the type in the Museum at Santiago.

Astragalus Gilliesii Philippi, Anal. Univ. Chile 31: 393 (1862), and *Linnaea* 33: 48 (1864).—"Portezuelo del Portillo, lado de Mendoza," 1860–61, *Diaz*.

This species was described without mature fruit. Judging from the description it might be a form of *A. Arnottianus* (Gillies) Reiche, or perhaps even a form of *A. carinatus* H. & A. I asked Prof. Espinosa for the privilege of examining a fragment of this type and was loaned material labeled "*Astragalus Gilliesii*, Portillo, lado de Mendoza, 1861–62, *W. Diaz*." This consisted of foliage and fruit of *A. Berteri* and flowers of *A. Cruckshanksii*. The material is not covered by the original description.

Astragalus gracilis Romero, Bol. Direc. Nac. Estad. y Estud. Geogr., La Paz, sec. Epoc. III, Nos. 31–33, pg. 45 (1920).—Not Nutt. (1817), nor Stev. (1842).

This species was described as follows in Romero's paper on the flora of the vicinity of La Paz, Bolivia: "*Astragalus gracilis*, sp. n. B. D. R.

Esta plantita erecta, delgada, con estipulas aladas, tiene foliolos lineares, semi-plegados, agudos y 8 yugados; sus espigas llevan pocas florecillas, la corola es blanca azuleda de 1 cm. de largo. Especie que la hemos recogido en los cerros de esta ciudad [La Paz].” This description, for the transcript of which I am indebted to Prof. Cardenas, is not detailed enough for the recognition of the species. The name is invalid in any case since it has two earlier homonyms.

Astragalus infirmus Steudel, Nomencl. ed. 2, 1: 161 (1840), nomen.

This name was applied to *Bertero* 820 from Chile. Among Steudel's specimens at Paris I could find no *Astragalus* bearing this number. The name, possibly, may refer to an *Adesmia*.

Astragalus lanuginosus Clos in Gay, Fl. Chile 2: 121 (1846); Reiche, Anal. Univ. Chile 97: 566 (1897), and Fl. Chile 2: 109 (1898). Not Kar. & Kir. (1841).

Tragacantha Gayana Kuntze, Rev. Gen. 2: 941 (1891).—Based upon *A. lanuginosus* Clos.

Astragalus hurtadensis Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 4, 4: 265 (1902).—Based upon *A. lanuginosus* Clos.

This species was based upon specimens lacking both flowers and fruit. It is represented at Paris by two sheets, evidently parts of a single collection. The label written by Gay reads, “492 Pr. de Coquimbo, *Astragalus* ? *lanuginosus* Clos, Fl. Chil. Cl. Gay, nait sur les collines exposé et sablonneuses des basses cordilleres de hurtado—a la Coipa, haut 1639 m., passé fleur au janvier, tres rare.” If this plant is really a species of *Astragalus* it is one entirely unknown to me. However, I incline towards the opinion that it is an *Adesmia* or some other genus, rather than an *Astragalus*.

Astragalus Philippianus (Kuntze) Hauman, Anal. Soc. Cien. Argentina 86: 281 (1918).

Phaca ? *amoena* Philippi, Linnaea 28: 620 (1857).—In cordillera de la Campana, pro. Santiago, Nov. 1833, *Germain*.

Astragalus amoenus (Phil.) Reiche, Anal. Univ. Chile 97: 569 (1897), and Fl. Chile 2: 112 (1898).—Not Fenzl (1842).

Tragacantha Philippiana Kuntze, Rev. Gen. 2: 941 (1891).—Based upon *P. amoena* Phil.

Astragalus santiagensis Spegazzini, Anal. Mus. Nac. Buenos Aires ser. 2, 4: 265 (1902).—Based upon *P. amoena* Phil.

A spreading silky-strigose perennial with united stipules. The type has flowers but no fruit. Reiche, l.c., has suggested that it may be a form of *A. Germaini*. This may be correct though the description might also apply to a form of *A. Cruckshanksii*.

Astragalus pictus Steudel, Nomencl. ed. 2, 1: 163 (1840).—Based on *A. bicolor* Desf.

Astragalus bicolor Desfontaines, Cat. Hort. Paris, ed. 3, additamenta 473 (1832–33), nomen, from “Chili.”—Not Lam. (1783).

No description has ever been associated with the two names above cited. Desfontaines treats the species as follows, “*bicolor* H. P. Chili, Temp. 24 ” The name is a nomen nudum and its application wholly obscure.

Astragalus quindecimjugas (Phil.) Reiche, Anal. Univ. Chile 97: 540 (1897), and Fl. Chile 2: 83 (1898).

Phaca quindecimjuga Philippi, Anal. Univ. Chile 21: 443 (1862), and Linnaea 33: 41 (1864).—"Cord. de Doña Ana, prov. Coquimbo, ca. 4000 ft. alt. Volckmann."

Described as a plant with connate stipules, slender sparsely silky ascending stems, glabrescent leaves, oblong-linear 15-jugate (8 mm. long and 4 mm. wide) leaflets, and elongate peduncles. The corolla is said to have the wings very evidently shorter than the keel. Concerning the fruit Philippi says, "El unico fruto que tiene el ejemplar es todavia verde i casi globoso." Reiche describes the fruit as, "Legumbre (en estado maduro desconocida) casi globosa, pelada con varias semillas." Fragments of the type loaned me by Prof. Espinosa show the leaves to be folded, glabrous except for a few appressed hairs along the midrib and about the margin near the apex. The ovary is glabrous and the flower in all details similar to that of *A. palenae*. I believe that *A. quindecimjugus* is based upon a collection from southern Chile and falsely labeled as from the andes of Coquimbo. It probably represents *A. palenae* var. *grandiflorus* Speg.

Astragalus sphaerocarpus Desfontaines, Cat. Hort. Paris ed. 3, additamenta 473 (1832-33), nomen.

This is a garden name which has never been associated with a description. Desfontaines published merely the following concerning it: "*sphaerocarpus* H. P. Chili. Temp. 2."

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

SECOND SUPPLEMENT TO THE SPONTANEOUS FLORA OF THE ARNOLD ARBORETUM

ERNEST J. PALMER

THE FIRST CATALOGUE of the Spontaneous Flora of the Arnold Arboretum, published in 1930¹, contained the names of 610 flowering plants and ferns, and a supplement in 1935² reported the discovery of 173 additions. The present paper adds 148 names, three of which are substitutes for ones published in previous lists. This brings the number of species, varieties, forms and hybrids that have so far been found growing without cultivation to the rather surprising total of about 930.

In the more than ten years that have elapsed since the last publication a diligent search has been carried on but, naturally, with somewhat diminishing results. Approximately sixty percent of the plants listed in this supplement are native to the Boston area and forty percent are introduced. But in some cases it is difficult to determine whether plants of native species are really indigenous or have come from seeds of cultivated plants. This is particularly the case with trees and shrubs, since such a complete collection of them has been established in the Arboretum, and the fruits and seeds are readily distributed by birds and other agencies. In trying to distinguish between native and introduced plants in the list, those native in the area have usually been counted in the first division, although the probability of their having come from cultivated plants is sometimes indicated in the notes.

Among native plants of considerable interest recorded for the first time in this list may be mentioned *Deschampsia flexuosa* (L.) Trin., *Alopecurus geniculatus* L., *Spartina pectinata* Bosc ex Link. *Scirpus planifolius* Muhl., *Carex virescens* Muhl., *C. aestivalis* M. A. Curtis, *C. laxiculmis* Schwein., *Anychia canadensis* (L.) B.S.P., *Corydalis sempervirens* (L.) Pers., *Mimulus ringens* L., *Campanula aparinoides* Pursh, and *Prenanthes altissima* L. *Anacharis occidentalis* (Pursh) Victorin and *Lemna minor* L. were apparently recent introductions and both seem to have disappeared, although it is not unlikely that they grew in the Arboretum area before and that they may reappear.

The Arboretum affords unusual opportunities for the introduction of exotic plants because of the varied and almost world-wide sources from which material is obtained. Seeds of weeds and other plants may be brought in with packing or soil about living material, or in seed, fertilizer or loam, and sometimes in rubbish that is dumped in certain places. The

¹ Jour. Arnold Arb. 11: 64-119. 1930.

² Ibid. 16: 81-98. 1935.

common agencies of birds and winds are also active. Many plants appear that are obviously only transient waifs and the source from which they come can in some cases be determined with reasonable certainty. Some waifs have been included in the lists when they seemed to be of sufficient interest, but a number of others of which specimens have been made for a record have been excluded. It is difficult to know where to draw a line in such cases; but in general plants that are almost certainly transient and that are of known origin have been excluded. Most of these appear on rubbish dumps, and they include such garden vegetables as maize, potato, pumpkin, beans, and spinach. Among other less common plants are species known to have been under investigation or to have been used experimentally by members of the staff of the Arnold Arboretum or of the Bussey Institution. A few others have been collected that have persisted from old gardens but which show no tendency to spread. Specimens of most of these may be found in the special herbarium of SPONTANEOUS PLANTS. All of the collections reported in this list and the numbers shown are those of the author, except as otherwise specified.

It is the intention of this paper, as was the case with the previous ones, to employ plant names approved by the latest usage. But so many changes have been made in recent publications in the interpretation of names and in the acceptance of earlier names for many species that the nomenclature of the earlier papers is in need of revision. Perhaps someday it will be possible to bring together and to revise all of the lists.

Thanks are due to Dr. L. H. Bailey for identifying most of the species of *Rubus* and to Dr. S. F. Blake and others for verifying or supplying determinations of a few plants in other difficult groups.

ENUMERATION OF THE ADDITIONAL PLANTS COLLECTED¹

Anacharis occidentalis (Pursh) Victorin. Water-weed. Shallow water and muddy margins of pond, South Street tract. No. 44701. Abundant and in flower in 1938, but not seen since.

**Bromus arvensis* L. Field Chess. Dry open banks north of Administration Building. No. 46002.

**Festuca elatior* L. var. *arundinacea* (Schreb.) Wimm. Gravelly bed of Bussey Brook, South Street tract. No. 46689.

Festuca rubra L. f. *prolifera* (Piper) Fernald. Open grassy slopes, Lilac group. No. 42856.

Poa nemoralis L. Open grassy ground near Dawson House. No. 42857.

**Poa trivialis* L. Waste ground, old quarry along Bussey Street. No. 43161.

Eragrostis Frankii (Fisch., Mey. & Lall.) Steud. Meadow near Celtis group. No. 39666.

**Eragrostis pilosa* (L.) Beauv. Waste and cultivated ground. No. 42973.

¹ Introduced plants are marked by an asterisk (*).

**Eleusine indica* Gaertn. Goose Grass. Waste ground, old quarry along Bussey Street and along path near *Cercidiphyllum* group. Nos. 40221, 46858.

Glyceria pallida (Torr.) Trin. var. *Fernaldii* Hitchc. Border of pond near Forest Hills gate. No. 28155.

Deschampsia flexuosa (L.) Trin. Hair Grass. On conglomerate outcrops and in dry gravelly soil, top of Hemlock Hill, Central Woods, and in *Malus* group, base of Peters Hill. Nos. 42842, 46169. Very local.

Agrostis stolonifera L. var. *compacta* Hartm. Creeping Bent Grass. Muddy margins of brook near Arborway wall southeast of Administration Building. Nos. 45248, 46160, 46674.

**Agrostis alba* var. *vulgaris* (With.) Thurb. Wet margins of small pond above *Fraxinus* group. No. 46672.

Alopecurus geniculatus L. Water Foxtail. In shallow water along margin of brook near Arborway wall. Nos. 45427, 46677.

**Alopecurus carolinianus* Walt. Southern Foxtail. Moist cultivated ground, south of Hemlock Hill. No. 45960.

Spartina pectinata Bosc ex Link. Prairie Cordgrass. Moist open ground along brook near Jamaica Plain gate. No. 44694. A large clump, seldom flowering.

Panicum agrostoides Spreng. Wet open ground, low meadow near Administration Building. No. 46535. Uncommon.

Panicum clandestinum L. Bank along road near *Robinia* group. No. 46694.

Panicum dichotomiflorum Michx. var. *geniculatum* (Wood) Fernald. Waste and cultivated ground. Nos. 38229, 43097.

**Setaria Faberii* Herrm. Rich waste ground, old quarry along Bussey Street. No. 47074.

Andropogon scoparius Michx. (*A. scoparius* var. *villosissimus* Kearney ex Scribn. & Ball). Dry open ground, Peters Hill. No. 44689. Uncommon.

Cyperus strigosus L. var. *capitatus* Boeckl. South Street nursery. No. 43408.

Eleocharis ovata (Roth.) R. & S. Muddy margin of pond. No. 35152.

Eleocharis capitata (L.) R. Br. var. *borealis* Svenson. Springy ground, south side of Peters Hill and along ditch in low meadow. Nos. 45974, 46007.

Scirpus planifolius Muhl. Dry open woods, top of Hemlock Hill. Nos. 45966a, 46010. Rare and local.

Scirpus expansus Fernald. Along drainage ditch, low meadow near Administration Building. No. 43408.

Scirpus atrovirens Muhl. var. *georgianus* (Harper) Fernald. Margins of brook near Arborway wall. No. 45218.

Carex scoparius Schkuhr var. *moniliformis* Tuckerm. Wet springy ground, southeast side of Peters Hill. No. 40293.

Carex tribuloides Wahlenb. var. *reducta* Bailey. Wet open ground, low meadow near Administration Building. No. 46006.

Carex cephalantha (Bailey) Bicknell. Wet ground about spring, southeast side of Peters Hill. Nos. 27976, 37723, 42599. Reported in the original list as *C. echinata* Murr.

Carex canescens L. Wet ground along brook north of Administration Building. No. 40038.

Carex virescens Muhl. Rocky slopes, south side of Hemlock Hill. No. 42833.

Carex aestivalis M. A. Curtis. Rocky slopes, south side of Hemlock Hill. No. 42832. Rare and local.

Carex laxiculmis Schwein. Open woods, Oak group. No. 42838. Uncommon.

Carex hystericina Muhl. Along ditch, low meadow near Administration Building. No. 46645.

Symplocarpus foetidus (L.) Nutt. Skunk Cabbage. Wet ground in a number of places throughout the Arboretum. This interesting plant, one of the first to bloom in spring, was referred to in former papers, but through oversight it was omitted from the list.

Lemna minor L. Small Duckweed. Stagnant pools along brook near Arborway wall. No. 46381. Transient.

Juncus dichotomus Ell. var. *platyphyllus* Wiegand. Open ground, low meadow near Administration Building, and in cultivated ground, South Street tract. Nos. 45666, 46557.

Juncus tenuis Willd. var. *anthelatus* Wiegand. Open ground, top of Hemlock Hill. No. 46692.

**Muscari botryoides* (L.) Mill. Grape Hyacinth. Grassy bank, Populus group, South Street tract. No. 44721. Well established.

**Iris Pseudacorus* L. var. *pallida* Hort. ex Bailey. Pale Yellow Iris. This form with very pale flowers is found in the low meadow near the Administration Building. No. 45894.

Salix discolor Muhl. var. *eriocephala* (Michx.) Anders. Wet open ground, low meadow near Administration Building. No. 46594.

Betula papyrifera Marsh. Paper Birch. Open woods, top of Peters Hill. No. 37755.

Celtis occidentalis L. Hackberry. Top of Hemlock Hill. No. 46369. Probably introduced here.

**Morus alba* L. White Mulberry. Waste ground, South Street tract. No. 43169.

**Rumex triangulivalvis* (Danser) Rech. f. (*R. mexicanus* of auth., not Meisn.). Along brook and about pond, South Street tract. No. 43173.

Polygonum aviculare L. var. *angustissimum* Meisn. Waste open ground. No. 44694a.

Polygonum aviculare var. *arenastrum* (Bor.) Rouy. Waste open ground. No. 44693a.

**Polygonum caespitosum* Blume var. *longisetum* (DeBruyn) Steward. A weed in waste ground. No. 46382, S. F. Blake & E. J. Palmer.

**Polygonum Bistorta* L. Bistorte, Snakeweed. A large colony near the bridle path in Conifer group. No. 46620.

**Chenopodium Botrys* L. Jerusalem Oak. Waste ground and rubbish dumps, about foundation of old Bussey mansion. Nos. 46649, 47073.

**Chenopodium glaucum* L. Oak-leaved Goosefoot. Along drainage ditch, low meadow near Administration Building. No. 42970.

**Chenopodium paganum* Reichenb. Lamb's Quarters. Waste ground, old quarry along Bussey Street. No. 46086.

Chenopodium hybridum L. Maple-leaved Goosefoot. Waste ground about foundation of old Bussey mansion. No. 47072.

Atriplex patula L. Orach. Waste and cultivated ground. Nos. 43078, 47939. Not common but apparently spreading.

**Axyris amaranthoides* L. Rocky waste ground, old quarry along Bussey Street. No. 46980. Probably only a transient weed.

**Amaranthus hybridus* L. Amaranth, Pigweed. Waste ground, South Street tract. No. 43083.

**Amaranthus hybridus* f. *hypochondriacus* (L.) Robinson. Prince's Feather. A weed in waste ground, old quarry along Bussey Street. No. 45249.

Anychia canadensis (L.) B. S. P. Forked Chickweed. Open wooded hillside, North Woods, near Robinia group. No. 45214. Rare and local.

**Arenaria serpyllifolia* L. Thyme-leaved Sandwort. A weed in cultivated ground. Nos. 43081, 44783.

**Agrostemma Githago* L. Corn Cockle. Waste ground, old quarry along Bussey Street. No. 43007. Probably only a transient waif.

**Silene Armeria* L. Sweet William Catchfly. Grassy border near Administration Building. No. 42688. Probably a transient waif.

Clematis virginiana L. Virgin's Bower. In tangle of shrubs along Meadow Road. No. 44912. Probably escaped from cultivation.

Menispermum canadense L. Moonseed. Among weeds and shrubs, Juglans group. No. 36535a. Probably escaped from cultivation.

**Eschscholtzia californica* Cham. California Poppy. On open bank near Administration Building. No. 44884. Escaped from cultivation.

Corydalis sempervirens (L.) Pers. Pink-flowered Corydalis. At foot of conglomerate ledge, top of Hemlock Hill. No. 46183. Rare and local.

**Brassica campestris* L. Rutabaga. A weed in waste ground near Administration Building. No. 44313.

**Brassica juncea* (L.) Cosson. Indian Mustard. Waste ground, old quarry along Bussey Street. No. 47010.

**Ribes rubrum* L. Red Currant. Moist ground, thickets near *Pterocarya* group. No. 44767.

**Spiraea japonica* L. f. Japanese Spiraea. Along margin of Bussey Brook near stone bridge. Nos. 46274, 47746.

**Malus micromalus* Mak. Rocky ground, old quarry along Bussey Street. No. 42697.

Sorbus americana Marsh. American Mountain Ash. Rocky open ground, top of Hemlock Hill. No. 46368. Probably escaped.

Aronia floribunda Spach. Chokeberry. Open rocky ground, top of Hemlock Hill. No. 46866. Introduced here.

Aronia prunifolia (Marsh.) Rehder. Wet ground about spring, south side of Peters Hill. No. 46977. Perhaps native.

**Potentilla intermedia* L. Dry open ground, South Street tract. No. 42820.

**Rosa suffulta* Greene. Among weeds and shrubs, Oak group. No. 39664.

Rubus idaeus L. var. *canadensis* Richards. Red Raspberry. Low meadow opposite Aesculus group. No. 45253a.

Rubus alius Bailey. Open ground, slopes of Bussey Hill. No. 46612.

Rubus semisetosus Blanchard. Open woods near top of Peters Hill. No. 46693.

Rubus rhodinsulanus Bailey. Open woods and thickets, Peters Hill. Nos. 43422, 43529.

Rubus novanglicus Bailey. Thickets and rocky open ground. Nos. 44356, 44361.

Rubus permixtus Blanchard. Rocky ground, top of Hemlock Hill. No. 46016.

Rubus frondosus Bigel. "Overlook," C. E. Faxon. 1919.

Rubus multiformis Blanchard. C. E. Faxon. 1913.

Rubus philadelphicus Blanchard. Rocky ground, Central Woods. No. 46653.

Rubus Rosa Bailey. Low meadow opposite Aesculus group. Nos. 45248, 46613.

**Rubus laciniatus* Willd. Persistent from cultivation, near site of old Bussey mansion. No. 46662.

Prunus pennsylvanica L. f. Pin Cherry. Rocky ground, top of Hemlock Hill. No. 45962.

**Medicago sativa* L. Alfalfa. Waste ground, South Street tract. No. 43166.

**Astragalus glaucophyllus* Bunge. Grassv bank near Bussey greenhouse. No. 44324.

Desmodium Dillenii Darl. Tick Trefoil, Stick-tight. Border of pond near Forest Hills' gate.

Lespedeza capitata Michx. Dry open ground, edge of woods, south side of Peters Hill. No. 43526.

Lespedeza capitata \times *hirta*. Plants that appear to be this hybrid were found growing with the supposed parent species on the south side of Peters Hill. No. 43526a.

**Oxalis corniculata* L. (*O. repens* of auth.). On base of rotting stump, near pond and Robinia group. No. 47127.

Zanthoxylum americanum Mill. Prickly Ash. Thickets, rocky ground on top of Hemlock Hill. No. 46419. Probably introduced from cultivated plants.

**Euphorbia maculata* L. (*E. Preslii* Guss.). Waste ground about foundation of old Bussey mansion. No. 46957. A recent introduction, but apparently spreading. The plant reported under this name in the original list is now known as *Euphorbia supina* Raf.

**Euphorbia virgata* Waldst. & Kit. Under trees, Conifer group. Leon Croizat. 1938.

Vitis riparia Michx. (*V. vulpina* of auth., not L.). River-bank Grape. Slopes of Peters Hill, Crataegus group, and in Conifer group. Climbing on trees and shrubs. Nos. 45669, 46562. No doubt introduced from cultivated plants.

Vitis aestivalis Michx. Summer Grape. Thickets, bank near Robinia group. No. 46695. Probably introduced.

**Viola blanda* Willd. Waste ground, old quarry along Bussey Street. No. 44726.

\times *Viola abundans* House (*V. fimbriatula* \times *sagittata*). Moist meadow, Maple group. No. 42810.

\times *Viola aberrans* Greene (*V. fimbriatula* \times *papilionacea*). Nos. 36407, 42682.

Viola fimbriatula \times *scabriuscula*. Grassy open ground near base of Peters Hill. No. 40023.

Viola lanceolata \times *sagittata*. Grassy open ground, Crataegus group, near base of Peters Hill. No. 42816a.

**Elaeagnus umbellata* Thunb. Oleaster. Thickets and waste ground. No. 46972. Frequently escaped and becoming abundant.

Oenothera laciniata Hill. Waste ground, fertile soil, near Dawson House. No. 42856.

Rhododendron viscosum (L.) Torr. White Swamp Azalea. Low ground along Bussey Brook, Conifer group. No. 39603. Plants coming up after persistent mowing, and probably native.

**Fraxinus pennsylvanica* Marsh. var. *lanceolata* (Borkh.) Sarg. Green Ash. On rubbish dump, South Street tract. No. 43519. Introduced here and probably not native in the Arboretum.

**Ipomoea purpurea* (L.) Roth. Purple Morning Glory. On rubbish dump, South Street tract. No. 43072.

Cuscuta pentagona Engelm. (*C. arvensis* Beyrich). Field Dodder. Along border of Bussey Brook, growing on tall herbs. No. 46400.

**Lithospermum arvense* L. Corn Gromwell. In cultivated bed near Administration Building. No. 44312. Transient.

**Physostegia virginiana* L. False Dragon Head. Waste ground, border of pond, South Street tract. No. 44700. Transient.

Lycopus virginicus L. Moist fertile ground at foot of Hemlock Hill and along brook. Nos. 28245, 46372.

**Mentha piperita* L. Peppermint. Waste ground near pond, South Street tract. No. 47260.

Prunella vulgaris L. var. *lanceolata* (Bart.) Fernald. Wet ground about spring, southeast side of Peters Hill. No. 44685.

**Solanum carolinense* L. Horse Nettle. Waste ground, old quarry along Bussey Street. No. 45212. Persistent and spreading for several years.

**Lycium halimifolium* Mill. Matrimony Vine. Rocky banks and waste ground. No. 38174. Escaped from cultivation.

Mimulus ringens L. Monkey Flower. Along drainage ditch, low meadow, and margins of Bussey Brook near Bussey Street. Nos. 43418, 46362.

Gratiola neglecta Torr. (*G. virginiana* of auth., not. L.). Hedge Hysop. Muddy margins of pond, South Street tract. No. 42997.

**Veronica arvensis* L. Corn Speedwell. Cultivated and waste ground. Nos. 42997, 43117. Not common.

**Galium Mollugo* L. A weed in cultivated beds. Nos. 44716, 46378, 46408a.

**Galium Aparine* L. var. *Vaillantii* (DC.) K. Koch. Grassy open ground, Conifer group. Nos. 45986, 46167.

Galium palustre L. Wet ground along margins of Bussey Brook. Nos. 42836, 45983.

Viburnum cassinoides L. Withe-rod, Wild Raisin. Open woods, Central Woods, and top of Hemlock Hill. Nos. 45516, 46867.

Viburnum recognitum Fernald. (*V. dentatum* of auth., not. L.). Arrow-wood. Thickets, rocky ground on top of Hemlock Hill. No. 46602.

**Viburnum Opulus* L. Cranberry-tree. Wet ground, south side of Peters Hill. No. 46975.

Campanula aparinoides Pursh. Marsh. Bluebell. In wet grassy and weedy ground, southeast side of Peters Hill. Nos. 45502, 46363. Very local.

**Liatris spicata* (L.) Willd. Blazing Star. Rocky waste ground, old quarry along Bussey Street. Nos. 42972, 42975.

Solidago gigantea Ait. var. *leiophylla* Fernald. (*S. serotina* Ait.) Smooth Golden-rod. Along margins of Bussey Brook near stone bridge. No. 47421. Rare.

Solidago altissima L. Tall Golden-rod. Open ground, south side of Peters Hill. No. 47113.

Solidago bicolor L. var. *lutea* Farwell. Dry open slopes of Peters Hill. No. 47937. Rays bright yellow.

Solidago canadensis × *juncea*. Dry open ground, south side of Peters Hill. No. 47937.

Solidago canadensis × *rugosa*. Open ground near Walter Street nursery. No. 47085.

Solidago juncea × *puberula*. Open ground near top of Peters Hill. No. 36387.

Aster novi-belgii × *vimineus*. Open springy ground, southeast side of Peters Hill. No. 46546. Growing with supposed parent species.

Aster lateriflorus × *paniculatus*. Border of low meadow, near Rhus group. No. 46967.

Erigeron pulchellus Michx. Robin's Plantain. Moist grassy ground, Peters Hill and near Arborway wall. Nos. 36387, 36415.

**Xanthium pennsylvanicum* Wallr. Cocklebur. Waste ground about pond, South Street tract. No. 46551.

**Helianthus petiolaris* L. Sunflower. South Street nursery. No. 44698.

**Helianthus doronicoides* Lam. Open woods, Oak group. Nos. 42978, 43084.

**Coreopsis major* Walt. var. *stellata* (Nutt.) Robinson. Among tall herbs and shrubs, Juglans group, and near Dawson nursery. Nos. 25885, 47239a.

Bidens vulgata Greene var. *puberula* (Wiegand) Greene. As a weed in cultivated ground, Deutzia beds. No. 46412.

**Cosmos bipinnatus* Cav. Cosmos. Waste ground, old quarry along Bussey Street. No. 43521. Probably only a transient waif.

**Helenium autumnale* L. Autumn Sneezeweed. Open grassy bank east of Administration Building. No. 45611.

**Matricaria matricarioides* (Less.) Porter. Pineapple-weed. Waste and cultivated ground. No. 46176.

**Chrysanthemum Parthenium* (L.) Bernh. Feverfew. Bank near Administration Building. No. 44913.

**Doronicum Pardalianches* L. Leopard's Bane. Open ground along bridle path, near Centre Street gate. Nos. 43115, 47171.

**Cichorium Intybus* L. f. *album* Farwell. Dry open ground, Peters Hill. No. 44690.

NOTES ON A NUMBER OF NEW GUINEAN SPECIES*

C. G. G. J. VAN STEENIS

APONOGETONACEAE

Aponogeton loriae Martelli in Nuovo Giorn. Bot. Ital. ser. 2, 3: 472, *pl.* 8. 1897.

BRITISH NEW GUINEA: Central Division: Kubuna, *L. J. Brass* 5567, Nov. 1933, alt. 100 m., common in shallow, stony streams in forest, leaves brown, completely submerged, spikes of greenish yellow flowers protruding just above the water. Western Division: Penzara, between Morehead and Wassi Kussa Rivers, *L. J. Brass* 8671, Dec. 1936, in stream in savanna forest.

The New Guinean specimens have sometimes been referred to *A. crispus* Thunb. by F. v. Mueller (Descr. Not. Pap. Pl. 2: 51. 1886), and to *A. monostachyum* L. f. by Hemsley (Kew Bull. 113. 1899), but they differ from both species in their greenish yellow flowers and the persistent spathe gradually decaying from the apex to the base. The leaves, for the most part, gradually taper into the petiole. This Papuan species is also known from the southern Celebes, and possibly occurs also in Queensland.

JUNCAGINACEAE

Triglochin procera R. Br. var. *dubia* Benth. Fl. Austral. 7: 168. 1878; Buchenau in Pflanzenr. 16(IV.14): 14. 1903.

BRITISH NEW GUINEA: Western Division: Penzara, between Morehead and Wassi Kussa Rivers, *Brass* 8447, Dec. 1936, savanna forest, common in streams which contain water only during the wet season; Tarara, Wassi Kussa River, *Brass* 8666, Jan. 1937, savanna forest, massed in a small stream, dry during the dry season. Plant about 50 cm. high; roots swollen into terminal tubers; leaves about 2 mm. broad; carpels free.

The first record of the genus within Malaysia, the species and a variety also known from Australia and Tasmania.

PONTEDERIACEAE

Monochoria hastata (L.) Solms in DC. Monog. Phan. 4: 523. 1883.

Pontederia hastata L. Mant. Pl. 362. 1771.

NORTHEAST NEW GUINEA: Morobe District, vicinity of Kajabit Mission, *Mrs. M. S. Clemens* 10636, Aug.-Dec. 1939, alt. 240-600 m.

DISTRIBUTION: From India to S. China and throughout Malaysia; as yet not reported from Queensland.

PHILYDRACEAE

Helmholtzia novoguineensis (Krause) Skottsberg in Bot. Jahrb. 65: 260. 1932; Bull. Jard. Bot. Buitenz. III. 13: 112. 1933.

Xerotidae sp., Teijsmann in Natuurk. Tijdschr. Ned. Ind. 37: 132. 1877.

Astelia novoguineensis Krause in Bot. Jahrb. 59: 559. 1924.

* Results of the Richard Archbold Expeditions.

NETHERLANDS NEW GUINEA: Idenburg River, 4 km. SW. of Bernhard Camp, *L. J. Brass* 13431, Mar. 1939, alt. 850 m., rare in rain forest ravines (flowers and fruit white); same locality, 6 km. SW. of Bernhard Camp, *L. J. Brass* 12859, Feb. 1939, alt. 1150 m., occasional in undergrowth of rain forest ravine (flowers and fruit white).

DISTRIBUTION: New Guinea and Moluccas (Ambon, Buru, Ceram); another species in Australia.

Philydrum lanuginosum Banks ex Gaertn. Fruct. 1: 62. 1788.

BRITISH NEW GUINEA: Lower Fly River, Gaima, east bank, savanna areas, *L. J. Brass* 8353, Nov. 1936, common in sedge stands in shallow swamps (flowers yellow); Western Division, Dagwa, Oriomo River, *L. J. Brass* 6002, Febr.—March 1934, common on fringes of small savanna swamps (flowers yellow).

DISTRIBUTION: From SE. and E. Asia to Australia, but within Malaysia hitherto only found in the Malay Peninsula. The record from Java on the basis of a Hillebrand specimen is doubtless due to an error in the locality, and Merrill (Philip. Jour. Sci. 10, Bot.: 88. 1915) showed that the Philippine record also was based on an erroneously localized collection. This is the first record of its occurrence in New Guinea.

Both members of this family here recorded were easily identified through Skottsberg's excellent revision in Bull. Jard. Bot. Buitenz. III. 13: 110–113. 1933.

HAEMODORACEAE

Haemodorum coccineum R. Br. Prodr. 300. 1810; F. v. Mueller Descr. Not. Pap. Pl. 2: 67. 1890.

BRITISH NEW GUINEA: Tarara, Wassi Kussa River, *L. J. Brass* 8384, Dec. 1936, savanna forest, common on sour gray clay soil flats (rootstock red inside; flowers red).

The genus was hitherto known only from Australia, but F. von Mueller mentioned it nearly sixty years ago as occurring on the Wassi Kussa River without indicating the collector.

DROSERACEAE

Drosera indica L. Sp. Pl. 282. 1753.

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *L. J. Brass* 7827, Sept. 1936, common in thick cover on wet grass-plains (flowers purple).

Drosera petiolaris R. Br. ex DC. Prodr. 1: 318. 1824.

BRITISH NEW GUINEA: Western Division, Wassi Kussa River, near Tarara, *L. J. Brass* 8386, Dec. 1936, on wet sandy flats (one of the first herbs to flower; flowers pink).

Drosera ? *spathulata* Labill. Nov. Holl. Pl. 1: 79, pl. 106, f. 1. 1804; Diels, Pflanzenr. 26 (IV.112): 83. 1906.

BRITISH NEW GUINEA: Wassi Kussa River, Tarara, *L. J. Brass* 8752a, Jan. 1937, on wet ground in savanna forest (rare herb; flowers white).

This specimen was found in a cover with *L. J. Brass* 8752 and separated at Buitenzorg. The dimensions of the three styles, which are bifid to the base, do not agree with Diels's description. The "normal" habitat in Malaysia for this species is found at medium or high altitudes; whereas,

D. burmannii Vahl (*L. J. Brass* 5962) occurs at low altitudes. In Australia, however, e.g. Queensland, *D. spathulata* Labill. also is found at low altitudes. It may be that this Papuan strain corresponds to the Queensland material. The type was collected at low altitude in Australia.

PODOSTEMONACEAE

Torrenticola queenslandica Domin in *Bibl. Bot.* 89²: 149, *pl.* 35, *fig.* 7-13. 1925; Engler, *Nat. Pflanzenfam.* II, 18a: 484. 1930.

Podostemon queenslandicus Domin l.c. nom. altern.

BRITISH NEW GUINEA: Port Moresby area, Roona, *C. E. Carr* 12415, July 29, 1935, about 700 m. alt., on submerged rocks in the Laloki River (plant dark green; fruit brown).

As far as I know this is the second collection of the species, and the first record of the occurrence of the family in New Guinea. The material is in the same advanced stage of growth as the original collection, but flowers are needed for any further remarks on its exact affinity. It exactly matches the figure of the type-collection.

The only previous record of this family in New Guinea was made by Zippel (*Flora* 12: 285. 1829; *Alg. Konst- & Letterbode* 1: 297. 1829) of *Lemnopsis mnioides* Zipp. According to Hallier f. (*Meded. Rijksherb. Leiden*) this is an *Utricularia*. In 1947 I could not trace the specimen in the Leyden Herbarium.

H. J. Lam (*Blumea* 2: 117. 1936) cited a passage from d'Albertis's "New Guinea: What I did and what I saw" 2: 93. 1880, relating to a peculiar plant which d'Albertis found June 17, 1876. "It grows on the heaps of stones that abound in the river, and seen from a certain distance, its dark color, almost black, and its peculiar shape make it resemble the scales of a serpent. Its branches lie flat, so as to offer as little resistance as possible to the water. It owes to this curious conformation its power of resisting the strength of the current." According to my wife's MS. cyclopedia of Malaysian collectors this must have been on the Fly River which d'Albertis ascended from May 22 till June 25, 1876. If the plant was *Torrenticola* the vegetative phase must have resembled the scales of a serpent. The tiny flowering stems cannot have been meant as one cannot see these "from a distance" separately. Another argument against identifying d'Albertis's plant as a representative of the Podostemonaceae is the fact that Brass explored the Fly River area, and has, to my knowledge, collected nothing of the kind.

CORYNOCARPACEAE

Corynocarpus australasica C. T. White, *Contr. Arnold Arb.* 4: 57. 1933.

NETHERLANDS NEW GUINEA: SW. New Guinea, Zwaluw bivak, *Branderhorst* 428, June 10, 1908 (shrub with immature flowers); id. *Tuinweg* near Kp. Kabatiel, *Branderhorst* 271, Dec. 6, 1907 (tree with fruit).

Both numbers were unidentified specimens in Herb. Bog., which undoubtedly belong to this Papuan-Queensland tree-species. It seems that

Beguín has collected a new species of the genus in Halmaheira (Moluccas).

STACKHOUSIACEAE

Stackhousia intermedia F. M. Bailey in Queensl. Agric. Jour. 3(4): 174. 1898; Brouwer in Blumea 3: 174. 1938.

BRITISH NEW GUINEA: Western Division: Mabaduan, *L. J. Brass* 6519, April 1936, common grass associate in savanna forests (flowers and fruit yellow); Wassi Kuasa River, Tarara, *L. J. Brass* 8661, Jan. 1937, common in savanna forests (flowers brown-green); Wuroi, Oriomo River, *L. J. Brass* 6072, Jan.-March 1934, alt. 30 m.; same locality and date, *L. J. Brass* 5760, alt. 10-30 m., sporadic and rather uncommon on savanna.

DISTRIBUTION: From Sumatra through Malaysia and the Philippines to North Queensland and Micronesia.

SAPINDACEAE

Sarcopteryx coriacea Radlk. Sapind. Holl.-Ind. 98. 1878.

NETHERLANDS NEW GUINEA: Arfak Mountains, Angi Lakes, by ♀ lake, *L. S. Gibbs* 5531, alt. 2100 m. (small tree; fruit red).

The material consisting of a duplicate from the Brit. Mus. Herb. exactly matches the other collections mentioned by Radlkofer. Neither Gibbs nor Radlkofer cited this number; it was inserted in Herb. Bog. as *Euonymus* sp.

BOMBACACEAE

Papuodendron lepidotum C. T. White in Jour. Arnold Arb. 28: 272, pl. 1. 1946.

NORTHEAST NEW GUINEA: between Umbili and Wobbe, *R. Schlechter* 16334, July 30, 1907, alt. 300-400 m.

This specimen, which was provisionally identified as a new species of *Cumingia* by Ulbrich in the Berlin Herbarium, is the first known collection of White's new genus.

Camptostemon philippinensis (Vidal) Becc. Malesia 3: 273. 1889; Bakhuizen van den Brink in Bull. Jard. Bot. Buitenz. III. 6: 219, 245. 1924; Troll in Flora n. ser. 28: 350. 1933.

Cumingia philippinensis Vidal Phan. Cuming. Philip. 212, pl. 1. 1885.

BRITISH NEW GUINEA: Western Division: Tarara, Wassi Kussa River, *L. J. Brass* 8517, Dec. 1936, common in mangroves (tree; flowers white); Mabaduan, *L. J. Brass* 6475, April 1936, very common mangrove tree, sometimes forming nearly pure forest (25 m. high, lower part of trunk fluted; bark ± scaly, reddish brown when cut; very numerous large flattened brown knobby pneumatophores).

Known from the Philippines, Borneo, the Moluccas, and North Australia; first record from New Guinea.

STYRACACEAE

Bruinsmia styracoides Boerl. & Koord. in Natuurk. Tijdschr. Ned. Ind. 53: 68. 1893.

NETHERLANDS NEW GUINEA: 2 km. SW. of Bernhard Camp, Idenburg River, *Brass & Versteegh* 13506, April 1939, alt. 700 m., frequent on slopes of primary forest (tree 20 m. high). NORTHEAST NEW GUINEA: Morobe District, Yunzaing, *Mrs. M. S. Clemens* 2970, April 1936, alt. 1500 m., forested hills.

DISTRIBUTION: From Sumatra to New Guinea, but hitherto in the latter island only reported from the southeast part, the record being based on a Forbes specimen.

Styrax agrestis (Lour.) G. Don, Gen. Hist. 4: 5. 1837.

NETHERLANDS NEW GUINEA: Idenburg River, Bernhard Camp, *L. J. Brass* 13953, April 1939, alt. 50 m., common in flooded perhaps permanently swampy rain forest of river plains (straggling tree attaining 12 m.; flowers white); same place and date, *L. J. Brass* 13820, swampy rain forest (shrub \pm 4 m. high). **BRITISH NEW GUINEA:** Middle Fly River, Lake Daviumbu, *L. J. Brass* 7565, Aug. 1936, common in brushy outskirts of lake shore rain forest (slender virgate tree 4–5 m. high). **NORTHEAST NEW GUINEA:** Morobe District, Yoangen to Mongi, *Mrs. M. S. Clemens* 6613, June 1937, alt. about 1000 m.

The species is distributed very widely, from Annam and Hainan through Borneo, Celebes, and the Moluccas to New Guinea, the Bismarcks, the Solomons, and Micronesia. Hitherto it was only reported from the northern parts of New Guinea. It seems to be exceedingly variable in habit, and very tolerant as to habitat.

SYMPLOCACEAE

Symplocos confusa Brand, Pflanzenr. 6(IV.242): 88. 1901.

NETHERLANDS NEW GUINEA: 9 km. NE. of Lake Habbema, *Brass & Versteegh* 10492, Oct. 1938, alt. 2600 m., rare (tree 20 m. high, 45 cm. diameter, crown not wide-spreading; bark 13 mm. thick, smooth; wood yellow-brown).

A widely distributed species, described under various names, known from SE. Asia (Ceylon to Luchu Islands) through Malaysia to New Guinea.

BIGNONIACEAE

Neosepicaea viticoides Diels in Bot. Jahrb. 57: 500, fig. 1. 1922.

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *L. J. Brass* 7580, Aug. 1936, abundant in rain forests (large canopy liane; corolla brown outside, purple within; [leaflets 3–4;] terminal panicle with young foliage); Lower Fly River, east bank, opposite Sturt Island, *L. J. Brass* 7994, Oct. 1936, in rain forest (high climbing liane; flowers streaked brown; [always 3 leaflets]). **NORTHEAST NEW GUINEA:** Kaiser Wilhelmsland, Djamu River, *R. Schlechter* 17557, April 1908, about 250 m. alt., liane in the forest.

Schlechter's collection is the first ever made of this species. In preliminary work this plant was identified as a member of the Verbenaceae, and I found Schlechter's number among the latter family inserted under a provisional name. The species was originally described by Diels as having 5–7 leaflets, but the Brass collections have only 3–4. The petiolule of the terminal leaflet is of the same length as those of the lateral ones and, hence, the leaf is digitately compound.

BOTANIC GARDENS,
BUITENZORG, JAVA.

ENDLICHER'S "GENERA PLANTARUM," "ICONOGRAPHIA
GENERUM PLANTARUM" AND "ATAKTA BOTANIKA"

WILLIAM T. STEARN

THE MOST IMPORTANT botanical work of the Austrian scholar Stephan Ladislaus Endlicher (1804-49) is probably his *Generum Plantarum secundum Ordines naturales disposita* (quarto, Vienna) which was published in 18 parts between 1836 and 1841. It describes about 7,200 genera, 40 of these being new genera proposed by Endlicher, and was the most detailed and comprehensive survey of the vegetable kingdom available until the publication of Bentham and Hooker's *Genera Plantarum* (1862-83). Its arrangement, as pointed out by Jessen, *Botanik der Gegenwart und Vorzeit*, 428. 1864, owes much to the earlier works of Jussieu, Bartling and Unger, but the descriptions, synonymy etc. were the result of Endlicher's own immense erudition and industry. Many of the genera are subdivided into sections. It is on account of the sectional names published here and often overlooked by later botanists that the work retains its reference value, and the dates of their publication are accordingly important.

A very useful account of a copy of the *Genera* having most of its original wrappers preserved was given by E. Migliorato-Garavini in *Annali di Botanica* (Roma) 3: 169-175. 1905 and supplemented in op. cit. 22: 44-45. 1941. There is also a short note on its publication in *Catalogue Books British Museum (Nat. Hist.)* 2: 529. 1904. Both, however, leave various points in doubt. The Lindley Library of the Royal Horticultural Society possesses a copy containing part of the original wrappers. Brockhaus, *Allgemeine Bibliographie für Deutschland* (Leipzig) listed the contents of the parts as they were received at Leipzig, and other contemporary references to the work are to be found in the *Verzeichnis neuer Bücher* of the Leipzig bookseller J. C. Hinrichs and the botanical periodical *Flora* (Regensburg). By correlating data from these sources the publication of Endlicher's *Genera Plantarum* becomes clearer and may be summarized as follows:—

Fascicle 1, pages 1-80, published probably Sept. 1836; fasc. 2, pp. 81-160, i-iv, publ. Dec. 1836; fasc. 3, pp. 161-240, publ. June 1837; fasc. 4, pp. 241-320, publ. Oct. 1837; fasc. 5, pp. 321-400, publ. Dec. 1837; fasc. 6 & 7, pp. 401-560, v-xii, publ. June 1838; fasc. 8, pp. 561-640, publ. Aug. 1838; fasc. 9, pp. 637-720, xiii-xvi, publ. Jan. 1839; fasc. 10, pp. 721-800, publ. March 1839; fasc. 11, pp. 801-880, publ. June 1839; fasc. 12, pp. 881-960, xvii-xx, publ. Nov. 1839; fasc. 13, pp. 961-1040, publ. Feb. 1840; fasc. 14, pp. 1041-1120, publ. April 1840; fasc. 15, pp. 1121-1200, publ. June 1840; fasc. 16, pp. 1201-1280, xxi-xxviii, publ. Aug. 1840; fasc. 17, pp. 1281-1360, xxix-xl, publ. Oct. 1840; fasc. 18, pp. 1361-1483, xli-lx, title, dedication, preface, publ. prob. Feb.-Mar. 1841.

The parts appear to have been received at Regensburg and Leipzig a month or two later than the months stated on the wrappers and accepted above, transport in central Europe being very slow before the building of railways. Thus the first part seems to have been dated "20 Aug. 1836" but the earliest notices of it are in *Allgemeine Bibliographie* 1836: 752. 4 Nov. 1836, *Literarische Zeitung* 3: 877. 9 Nov. 1836, *Börsenblatt* 1836 (no. 45): 45. Nov. 1836; probably it appeared in September 1836. Migliorati was under the impression that the work may have consisted of 19 parts. It is, however, certain from the notices in *Allgemeine Bibliographie* 1841 (17): 171. 23 April 1841, Wikström, *Jahresber. Bot.* 1839-42: 2. 1846 and Hinrichs, *Verz. Büch. Jan.-Juni 1841*: 66. 1841 that the eighteenth part was the last and contained pages 1361-1483; as the preface is dated "Januar. MDCCCXXXI," this part was probably published in February 1841. For corrections of the index, which occupies pp. 1429-1483 and contains about 17,500 names, see *Botanische Zeitung* 3: 301-306. 1845.

Five Supplements were published: —

(1) *Supplementum* I occupies pp. 1335-1427 of the main work and was issued in parts 17 and 18 (1840-41) of this. The others were separate publications.

(2) *Mantissa botanica, sistens Generum Plantarum Supplementum secundum*. 114 pages. 1842 (after March).

(3) *Mantissa botanica altera, sistens Generum Plantarum Supplementum tertium*. 11 pages. 1843 (after October 4).

(4) *Generum Plantarum Supplementum quartum, Pars II*. 96 pages. 1847 (according to title-page) or 1848.

(5) *Generum Plantarum Supplementum quintum*. 104 pages. 1850.

Pars 1 of *Supplementum IV* was never published. *Supplementum V* (or IV Pars 3) lacks a title-page and was completed by Eduard Fenzl after Endlicher's death. On the wrapper it is entitled "Supplementum Quintum" but the pages bear the heading "Supplementum IV Pars III."

The *Genera Plantarum* has no illustrations but these are provided in a companion work, Endlicher's *Iconographia Generum Plantarum* (quarto, Vienna) with engraved plates, mostly by Ferdinand Bauer and mostly illustrating Australian species; there are also some plates by Eduard Fenzl, Aloys Putterlinck and Josef Zehner. The number at the right-hand corner of the plate is that under which the genus illustrated is described in the *Genera*. The plate number is in the lower right-hand corner. The plates may thus be arranged as issued according to the plate numbers or re-arranged systematically by families according to the generic numbers. The Index (pp. xiv-xvi) correlates the two sets of numbers. The *Iconographia* was likewise published in parts, dated as follows:

Fascicle 1, plates 1-12, 1837; fasc. 2, pl. 13-24, 1837; fasc. 3, pl. 25-36, 1837; fasc. 4, pl. 37-48, title, dedication, pp. v-viii, 1838; fasc. 5, pl. 49-60, 1838; fasc. 6, pl. 61-72, 1839; fasc. 7, pl. 73-84, 1839; fasc. 8, pl. 85-96, 1839; fasc. 9, pl. 97-108, 1840; fasc. 10, pl. 109-125, pp. ix-xvi, 1841.

Only four hitherto unpublished names appeared on the plates of the *Iconographia*, and of these *Litsea Baueri* Endl. op. cit. t. 44, 1838, p. x. 1841 alone concerned an undescribed species, collected by Bauer in Australia (Nova Hollandia). *Coprosma Baueri* Endl. op. cit. p. x, t. 111. 1841 was published as a new name for the Norfolk Island plant described in detail by Endlicher, *Prodr. Fl. Norfolk* 60, n. 117. 1833 as "*C. lucida* Forst.," while *Anoplanthus uniflorus* (L.) Endl. op. cit. t. 72. 1839; p. xii. 1941 and *Stirlingia anethifolia* (R. Br.) Endl. op. cit. t. 23. 1837; p. xi. 1841 were new combinations, as is made clear by the synonymy etc. in "Conspectus Dispositionis Tabularum" on pp. ix-xiii; this also indicates the material from which the plates were drawn.

The quarto *Iconographia* was preceded by an illustrated folio work, *Atakta botanika. Nova Genera et Species Plantarum descripta et Iconibus illustrata*, which, despite the excellence of its large detailed plates, is bibliographically a most unsatisfactory work. The title-page is dated "MDCCCXXXIII" and there is nothing within the work itself to indicate that it was published in 5 parts between 1833 and 1835. Moreover it terminates abruptly in the middle of a word and lacks an index. The first two plates (illustrating *Diesingia scandens*) are without numbers; the last plate is numbered 40, but the work contains only 35 plates, for tt. 10, 26, 28, 37, 38 were never published. There is no text to tt. 27-40, although several of these figure undescribed species. The names on the plates are, however, validly published, despite the absence of descriptions, because the plates give detailed analyses of floral structure. The name *Atakta botanika*, chosen to indicate that the work was a botanical miscellany without any systematic or geographical order, is from the Greek ἄτακτος ('undisciplined, not in battle order, irregular') and proved all too appropriate! Endlicher wrote most of the text, but Fenzl contributed some descriptions. The plates are by Ferdinand Bauer, Endlicher, Fenzl, Franz Xavier, Fieber and Zehner. The publication of *Atakta botanika* is shown by contemporary references to have been as follows:

Contents	Publication Date	Authority
Fascicle 1 pp. 1-6, tt. 1-5	1833	cf. Hinrichs, Verz. Bücher July-Dec. 1833, p. 55; Wikström, Jahresb. Bot. 1833: 50. 1835.
Fascicle 2 pp. 7-12, tt. 6-11	1833 or 1834	cf. Hinrichs, Verz. Bücher July-Dec. 1834, p. 56; Wikström, Jahresb. Bot. 1834, p. 30. 1836.
Fascicle 3 pp. 13-20, tt. 12-24	1834	
Fascicle 4 pp. 21-26, tt. 25-40	1835	cf. Hinrichs, Verz. Bücher Jan.-Juni 1835, p. 54; Wikström, Jahresb. Bot. 1834; 53. 1836.

The following species are figured in this work: — *Alseis floribunda*, t. 33; *Anamirta Baueriana*, n. sp., tt. 39–40; *Brachystemma calycinum*, 18, t. 16; *Ceratotheca sesamoides*, 5, t. 5; *Dalechampia papposa*, n. sp., 22, tt. 20–21; *Deppea hedyotideae*, 25, t. 24; *Diesingia scandens*, 1, tt. 1–2; *Dodonaea hispidula*, n. sp. (= *Distichostemon hispidulum*), t. 30; *Dodonaea humilis*, n. sp., t. 31; *Exostyles venusta*, 26, t. 25; *Fenzlia obtusa*, n. sp., 19, t. 17; *Fenzlia retusa*, n. sp., 20, t. 18; *Ficinia aphylla*, 12, t. 12; *Gillia* (= *Gilia*) *dianthoides*, n. sp., t. 29; *Gonotheca Blumei*, 23, t. 22; *Haloragis ceratophylla*, 16, t. 15; *Hemispadon pilosus*, n. sp., 3, t. 3; *Klotzschia brasiliensis*, 21, t. 19; *Kohautia senegalensis*, 24, t. 23; *Limnanthes Douglasii*, t. 27; *Lippaya telephioides*, n. sp., 13, t. 13; *Malesherbia fasciculata*, 9, t. 9; *Monotaxis tridentata*, n. sp., 8, t. 8; *Morus Brunoniana*, n. sp., t. 32; *Odontostemma glandulosum*, t. 34; *Polygala Hilariana*, 4, t. 4; *Portulaca australis*, n. sp., 7, t. 6; *Pseudanthus pimeleoides*, 11, t. 11; *Quintinia Sieberi*, t. 10; *Rubus Zahlbrucknerianus*, n. sp., t. 35; *Schiedea ligustrina*, 15, t. 14; *Sipanea radicans*, n. sp., 7, t. 7; *Ungnadia speciosa*, n. sp., t. 36.

Morus Brunoniana, Endlicher, *Atakta Bot.* t. 32. 1835 is usually considered conspecific though not identical with *M. pendulina* Endlicher, *Prodr. Fl. Norfolk* 40. 1833, the collective species being known as *Pseudomorus Brunoniana* (Endl.) Bureau. The epithet *pendulina* (referring to the pendulous male catkins) has, however, priority over *Brunoniana* (honouring Robert Brown, 1773–1858) since Endlicher's *Prodromus Florae Norfolkicae sive Catalogus Stirpium quae in Insula Norfolk annis 1804 et 1805 a Ferdinando Bauer collectae* was undoubtedly published in 1833, being listed in Hinrichs, *Verz. Bücher July-Dec. 1833*, p. 55 and reviewed in *Allgemeine Bot. Zeitung* 16: ii (48): 754. Dec. 1833, while part 4 of the *Atakta botanika*, containing pls. 25–40, did not appear until 1835. The area of the genus *Pseudomorus* Bureau (Moraceae) extends from Australia (New South Wales, Queensland) over Norfolk Island and New Caledonia to Hawaii. The four geographically isolated populations which make up this range might be regarded as independent species, but Bureau, Bentham and Skottsberg* treat them as conspecific. Comparison

* Accepting Skottsberg's view of the taxonomy of *Pseudomorus* as outlined in *Acta Horti Gotoburg.* 15: 347–350. 1944, the nomenclature of the group is as follows: —

Pseudomorus pendulina (Endl.) Stearn, trans. nova.

Pseudomorus pendulina var. α *pendulina*, var. nov.

Morus pendulina Endlicher, *Prodr. Fl. Norfolk.* 40. 1833.

Streblus pendulina (Endl.) F. Mueller, *Fragm. Phyt. Austral.* 6: 192. 1868.

Pseudomorus Brunoniana α *pendulina* (Endl.) Bureau in *Ann. Sci. Nat. Bot. sér.* 5, 11: 372. 1869. — De Candolle, *Prodr.* 17: 249. 1873, sensu stricto.

Pseudomorus Brunoniana α *pendulina* subvar. *castaneaefolia* variatio *scabra* Bureau in *Ann. Sci. Nat. Bot. sér.* 5, 11: 373. 1869. — De Candolle, *Prodr.* 17: 250. 1873.

Norfolk Island.

Pseudomorus pendulina var. β *australiana* (Bureau), comb. nov.

Morus Brunoniana Endlicher, *Atakta Bot.* t. 32. 1835.

Streblus Brunoniana (Endl.) F. Mueller, *Fragm. Phyt. Austral.* 6: 192. 1868.

of abundant material showing adequately the variation within each population is needed to make clear the extent of morphological overlap; their present classification is necessarily provisional.

Stephan Ladislaus *Endlicher* was born at Bratislava (Pressburg), then part of the Austrian Empire, now in Czechoslovakia, on 24 June 1804 and died at Vienna on 28 March 1849. He studied at the Universities at Budapest and Vienna, obtaining his doctorate of philosophy in 1823. Although he intended an ecclesiastical career, the study of natural history and of languages attracted him strongly and in 1826, for family reasons, he resigned holy orders. He then joined the staff of the Imperial Library at Vienna in 1827, being employed on the preparation of the catalogue of manuscripts, and became Keeper (Custos) of the Imperial Natural History Collections (Hofnaturalien-Cabinette) in 1836. On the death of Joseph Franz Jacquin in December 1839 Endlicher succeeded him as Professor of Botany at the Wiener Hochschule and Director of the Botanic Garden. His colleague Eduard Fenzl then became Custos of the Hofnaturalien-Cabinette. During this period Endlicher prepared not only such important botanical works as his *Flora Posoniensis* (1830), *Prodromus Florae Norfolkicae* (1833), *Genera Plantarum* (1836-41), *Enumeratio Plantarum xx Novae Hollandiae* (1837) but also a catalogue of the codices in the Imperial Library (1836), and a catalogue of the Chinese and Japanese coins at Vienna (1837).

After the completion of the *Genera Plantarum* Endlicher published a companion volume *Enchiridion Botanicum exhibens Classes et Ordines Plantarum* (1841), devoted to the definition of the families and merely listing the genera. He also wrote a *Synopsis Coniferarum* (1847) and collaborated with Eduard Poeppig in writing the text of vols. 1 and 2 (1835-38) of *Nova Genera ac Species Plantarum, quas xxx legit E. Poeppig*. This immense literary output is as remarkable for its variety

Pseudomorus Brunoniana (Endl.) Bureau in Ann. Sci. Nat. Bot. sér. 5, 11: 372. 1869. — De Candolle, Prodr. 17: 249. 1873, sensu stricto. — Bentham, Fl. Austral. 6: 181. 1873. — C. Moore et Betche, Handbk. Fl. N. S. Wales, 83. 1893. — F. M. Bailey, Compr. Cat. Queensl. Pl. 485. 1913.

Pseudomorus Brunoniana β *australiana* Bureau in Ann. Sci. Nat. Bot. sér. 5, 11: 373. 1869. — De Candolle, Prodr. 17: 250. 1873.

Australia (Queensland, New South Wales); cf. Bentham (1873), Moore et Betche (1893).

Pseudomorus pendulina var. γ *obtusata* (Bureau), comb. nov.

Pseudomorus Brunoniana γ *obtusata* Bureau in Ann. Sci. Nat. Bot. sér. 5, 11: 374. 1869. — De Candolle, Prodr. 17: 250. 1873.

New Caledonia; cf. Guillaumin, Cat. Phan. Nouvelle-Calédon. Apét. 26. 1911.

Pseudomorus pendulina var. δ *sandwicensis* (Degener), comb. nov.

Pseudomorus sandwicensis Degener, Fl. Hawaii. 21/12. 1938.

Pseudomorus Brunoniana var. *sandwicensis* (Degener) Skottsberg in Acta Horti Gotoburg. 15: 347. 1944.

Hawaiian Islands (Kauai, Oahu, Hawaii).

and quality as for its volume; it reveals, as his biographer Wurzbach* truly noted, an exceptional range of knowledge and fertility of spirit, and is distinguished by a depth of understanding, independence and keenness of judgment and acuteness of observation, which place Endlicher among the great taxonomists of the nineteenth century, with Augustin Pyramus de Candolle, George Bentham, Sir Joseph Hooker and Adolf Engler. Botany naturally occupied most of his attention after his appointment as Professor of Botany, but he worked nevertheless at publications on the elements of Chinese grammar (1845) and the laws of Saint Stephan (1849). Popular with his students and a liberal-minded patriot, Endlicher took part in the unsuccessful Vienna Revolution of 1848 and was punished by being deprived of his professorship. Life then became so miserable for him that he is believed to have ended his troubles by suicide. Thus, prematurely and tragically, ended a life industriously and fruitfully spent in public service and the advancement of learning.

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* See C. V. Wurzbach, *Biographisches Lexikon des Kaiserthums Oesterreich* 4: 44-46. 1858 for a biography and bibliography of Endlicher and op. cit. 4: 179-181. 1858 for a biography and bibliography of his co-worker and successor Eduard Fenzl (1808-1879).

ON THE IDENTITY OF THE GENERA CUPULISSA RAF. AND PLATOLARIA RAF.

E. D. MERRILL AND N. Y. SANDWITH.

Platolaria Raf. Sylva Tellur. 78. 1838, with a single species, *P. flavescens* Raf., was based entirely on *Bignonia orbiculata* Jacq. = *Anemopaegma orbiculatum* (Jacq.) DC. The record here is clear, but manifestly *Platolaria* Raf. (1838) has priority over *Anemopaegma* Mart. (1845). A synonym of *Anemopaegma orbiculatum* (Jacq.) DC. is *Pithecoctenium panamense* Benth. Bot. Voy. Sulph. 129. 1844.

The case of *Cupulissa* Raf. Flora Tellur. 2: 57. 1836 [1837], currently placed as a synonym of *Bignonia* Linn., was not so clear. Because it became desirable to place *Cupulissa* Raf., in connection with the preparation of a comprehensive Index Rafinesquianus by the senior author, an inordinate amount of time was devoted to this case, with much correspondence regarding the matter. The difficulty was that no botanist had made a critical study as to the generic position of *Bignonia grandifolia* Jacq., which manifestly does not belong in *Bignonia* as that genus is currently restricted. The species is now shown to belong in *Anemopaegma* Mart., and thus we have still another generic name, *Cupulissa* Raf., to account for, earlier than both *Platolaria* Raf. and *Anemopaegma* Mart. On the basis of strict priority *Cupulissa* Raf. takes precedence over the other two proposed names for this particular genus.

Several excellent coloured plates of *Bignonia grandifolia* Jacq. have been published, all apparently based on material derived from the plant first cultivated in Vienna toward the end of the eighteenth century. Probably the chief reason why Jacquin's striking species was not disposed of earlier was that it remained unrepresented in most European and American herbaria until very recently and again because its fruits were, and still are, unknown. As a matter of fact the species, said to have come from Carácas, and originally described from a living specimen in conservatory cultivation in Vienna before 1798, was not actually re-collected in Venezuela or elsewhere until 1937, approximately 140 years after it was first described and illustrated. This, in view of the distinctly spectacular nature of the species, with its abundance of large, bright yellow flowers, is all the more surprising. The explanation is that apparently the species is of somewhat local occurrence, and that it grows in regions which have not, until very recently, been intensively explored from a botanical standpoint. Probably the indication of the type locality as "Caracas" has confused the issue, for the species does not grow in the immediate vicinity of the city of Carácas, although it is now known from one modern collection in Venezuela.

From an examination of the original description and the several coloured plates it was evident that some group in the vicinity of *Anemopaegma* Mart. was represented, but from the data available, and with no specimens for study, the senior author could not be certain as to the genus actually represented. Attempts to match Jacquin's species in the extensive collections at the Muséum d'histoire naturelle, Paris (Dr. Pichon), at the New York Botanical Garden (Dr. Moldenke), at the Missouri Botanical Garden (Dr. Seibert), at the Gray Herbarium and the Arnold Arboretum failed, and the first attempts at the U. S. National Herbarium and at the Chicago Natural History Museum were fruitless. An examination of the material in the herbaria in and near London by the junior author failed to locate any specimen in the Lindley Herbarium (Dr. Gilbert-Carter), at the British Museum (Dr. George Taylor), and at Kew, other than one specimen in the latter herbarium placed under the unidentified specimens of *Anemopaegma*. This was labelled in Sir William Hooker's handwriting "*Bignonia grandifolia* Bot. Mag. Hort. Eblan. [Dublin]." The specimen was clearly taken from the plant on which the Botanical Magazine plate was based. Some years ago the junior author had written on the sheet "cf. *Anemopaegma*." A critical re-examination of the specimen showed clearly that it agrees with *Bignonia grandifolia* Jacq. and that *Anemopaegma* Mart. is the genus represented. An opened calyx shows the characteristic disk and ovary perfectly. The leaflets agree very well with those of Jacquin's plate, as do the pseudostipules, the tendril, the calyx, the long linear bracts, and the stamens. The curious "warts" or "raised points" on the branchlets, petioles, and peduncle are actually raised lenticels, and are fewer and less conspicuous on the Botanical Magazine specimen than as shown in Jacquin's illustration; in the latter it is suspected that the number and eminence was exaggerated. We have seen nothing exactly like them in any other described species of *Anemopaegma*. The apparent discrepancy in the calyx-margin as shown in the several plates is of no significance; in fact, some of the calyces of the Botanical Magazine material are split and irregularly lacerate exactly as shown in Jacquin's plate. Neither is there any significance in the fact that the inflorescences as shown in the Botanical Magazine, based on the Dublin specimen, and in the Botanical Register (based on a specimen grown by Mr. Catley at Barnet) exhibit no 3-flowered cymes in the lower parts. The junior author's first report after having attentively examined three coloured plates (Jacquin's original, Botanical Register, and Botanical Magazine), and descriptions, and considering the several genera suggested as possibilities, includes the statement:

"First of all, even without other evidence, I have no hesitation in referring the plant figured and described by Jacquin as *Bignonia grandifolia* to the genus *Anemopaegma*. The three plates represent one and the same species. Jacquin's species has the characteristic ovary of *Anemopaegma* (ellipsoid or ovoid-ellipsoid, often striate or furrowed, and usually conspicuously contracted into the disk), as well as the large pulvinate disk.

Other characters such as the simple tendril, the absence of gland-fields at the nodes, the calyx, and the glabrous, bright yellow corolla are all characters of species of *Anemopaegma*."

We have been unable to refer the species to any described one now placed in *Anemopaegma*, or for that matter, in any other allied genus. It is believed that had the fruits been known (they are still unknown and hence undescribed) that the species might long since have been transferred to *Anemopaegma*.

With certain definite data available regarding the generic position of the species requests were again sent to the Chicago Natural History Museum and to the U. S. National Herbarium for a re-examination of the unnamed Venezuelan material in *Anemopaegma* and in *Bignonia*. Dr. Steyermark reporting from Chicago, and Mr. Killip, reporting from Washington, are in agreement that *Bignonia grandifolia* Jacq. is actually represented by one modern collection, this being *Pittier 14023* from the Ocumare Valley, Venezuela, May 29, 1937. The senior author has actually examined the Chicago specimen, courteously loaned for the purpose, and agrees with this identification of it.

These new data were transmitted to Dr. Léon Croizat who had recently reported for duty in Carácas. On March 24, 1947, he reported that there are two places in Venezuela known as Ocumare, one Ocumare de la Costa in the State of Aragua, the other, Ocumare del Tuy in the state of Miranda; and that the Pittier collection came from Ocumare de la Costa. The actual place where Dr. Pittier rediscovered the species is about 90 kilometers, air line, or about 140 kilometers by road, from Carácas, on the northern slopes of the coastal cordillera, approximately 600 meters below the pass leading from Maracay to Ocumare; this is the road from Carácas to Puerto Cabello, and, one suspects, the route that Jacquin followed on leaving Carácas on his return to Europe. With the generic identity of Jacquin's striking species now established, and with the Botanical Magazine specimen and one modern collection for examination, the following transfer is made:

ANEMOPAEGMA Martius ex de Candolle Prodr. 9: 187. 1845.

Cupulissa Rafinesque Flora Tellur. 2: 57. 1836.

Platolaria Rafinesque Sylva Tellur. 78. 1837.

Anemopaegma grandifolium (Jacq.) comb. nov.

Bignonia grandifolia Jacq. Pl. Hort. Schoenbr. 3: 19, pl. 287. 1798; Willd. Sp. Pl. 3: 296. 1801; Poir. in Lam. Encycl. Suppl. 1: 633. 1810; Edwards Bot. Reg. 5: pl. 418. 1819; Spreng. Syst. Veg. 2: 830 [sphalm. grandiflora]. 1825; Hook. Bot. Mag. 57: pl. 3011. 1830; Van Géel Sert. Bot. Cl. xiv. 1830 (the binomial erroneously credited to Willdenow; the coloured plate based on Bot. Reg. pl. 418); Reichb. Fl. Exot. 3: 48, pl. 213. 1835 (the coloured plate a reproduction of that of Van Géel); DC. Prodr. 9: 159. 1846; Knuth Repert. Sp. Nov. Beih. 43: 638. 1927 (Init. Fl. Venezuel.).

Cupulissa grandifolia Raf. Fl. Tellur. 2: 57. 1836 [1837], based on *Bignonia grandifolia* Jacq.

Messrs. Willdenow, Sprengel, De Candolle, and Knuth, saw no speci-

mens representing the species, accepting it on the authority of Jacquin or of later authors. On the other hand Poiret adds at the end of his description "v.s." indicating that he had seen a specimen. There is no evidence that Van Géel or Reichenbach knew the species in cultivation for their coloured plates are manifestly copied from the one in the Botanical Register. Their statement as to the year of introduction into Europe, 1815, is of course erroneous, and was perhaps suggested by the Botanical Register entry of 1819: "We believe the plant is of very recent introduction." We suggest that the species did not persist in conservatory cultivation in Europe because of its rank growth habit.

With this disposition of *Bignonia grandifolia* Jacq., we now take up the problem of the proper generic name. *Cupulissa* Raf. (1836) has priority followed by *Platolaria* Raf. (1837), and *Anemopaegma* Mart. (1845). With 60 binomials already published in *Anemopaegma* Mart. and because that name has been consistently used since 1845 as the generic one for this group, we unhesitatingly recommend that *Anemopaegma* Mart. ex DC. Prodr. 9: 187. 1845, be added to the list of conserved generic names, and that *Cupulissa* Raf. Flora Tellur. 2: 57. 1836 [1837], and *Platolaria* Raf. Sylva Tellur. 78. 1838, be rejected.

Rafinesque's original descriptions of his two new genera are characteristically short, yet there is no doubt as to exactly what he had in mind. That of *Platolaria* Raf. Sylva Tellur. 78. 1838 is:

"448. PLATOLARIA Raf. diff. Bignonia Siliqua maxima orbiculata plana. *Scandens*, fol. digit. fl. racemosis — Very distinct by mere fruit said to be akin to that of Bign. cerulea, see 458. The flowers are not described."

"449. *Platolaria flavescens* Raf. Bign. orbiculata Jaq. auct. — fol. 5 natis ovatis acum. cirrhosis, racemis axil, sub 10fl. — Carthagera, fl. yellowish."

The description of *Cupulissa* Raf. Flora Tellur. 2: 57. 1836 [1837], is somewhat more ample. The problem here was a proper interpretation of *Bignonia grandifolia* Jacq., which was the sole basis of the proposed new genus.

"203. CUPULISSA Raf (cup split) diff. from Bignonia, cal. cupularis integro latere fisso, Cor. tubulosa campanul. limbo undulato subeq. Sloblo, lob. inf. fisso. filam. basi glandul. hirsutis, didyn. quinto ster. ovar. supra disco glanduloso, stigma bilamel. *Scandens*, fol. conjug. fl. racemosis. — Type *C. grandifolia*, foliolis 2 ovatis undul. cirrhosis verrucosis, racemis multifl. pedic. bibract. flexuosis. — Carracas, large yellow flowers. *Bignonia grandif.* Jaq. hort. 287. Bot. Reg. 418, Bot. Mag. 3011, auctoris. Probably several Bignonias belong here, the real have cal. dent. cor. bilabiate &c."

The above is the Rafinesque record for the two genera. As no other botanist has ever recognized either of them while *Anemopaegma* Mart. is universally accepted, and further because of the large number of species involved, we believe that we are justified in recommending the conservation of Martius' generic name and the rejection of the two earlier Rafinesque

ones. Of the two Rafinesque names *Cupulissa* Raf. is earlier than *Platolaria* Raf. so that if others do not agree with our conclusions, as to the retention of *Anemopaegma* Mart., *Cupulissa* Raf. would be the logical choice.

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STUDIES IN THE THEACEAE, XVI
BIBLIOGRAPHICAL NOTES ON THE GENUS LAPLACEA

CLARENCE E. KOBUSKI

WHILE WORKING over the genus *Laplacea* in connection with my study of Theaceae I have discovered that by some peculiar oversight the type-species of the genus *Wikstroemia* Schrader has never been officially transferred to *Laplacea*, the accepted name by which Schrader's entity is now known.

As far as the generic name *Laplacea* is concerned, there is no involved synonymy if one abides by the "Rules of Nomenclature," since the name has been adopted as one of the "nomina conservanda." However, before *Laplacea* was placed on the conserved list considerable feeling was expressed by various authors in favor of one or another of the generic names now recognized as synonyms of the genus.

Blake, in Contrib. Gray Herb. 53: 39. 1918, made a very detailed study of the situation and maintained that the original name *Wikstroemia* Schrader should be retained for the genus, regardless of the fact that a much larger genus in the Thymelaeaceae possessed the same name and had been placed on the list of conserved names in 1905. At the same time he proposed new combinations for all the then existent species and varieties of Schrader's genus.

However, as Blake pointed out, *Wikstroemia* Schrader was described in 1821, while *Wikstroemia* Endlicher, a genus of the Thymelaeaceae, was introduced much later, in 1833. Also the name *Wikstroemia* Endlicher, borne by a large genus and generally accepted, was long antedated by the name *Capura* Linnaeus which was introduced in 1771. There was good logic in Blake's stand, which, however, went for nought, since the name *Wikstroemia* had already been adopted and conserved for the larger genus in the Thymelaeaceae. *Laplacea* was eventually conserved for the genus of the Theaceae. It is interesting to note that when the name *Laplacea* finally appeared as the conserved name in Kew Bull. 1940: 112. 1940, the synonym or rejected names listed were *Haemocharis* Salisb. and *Lindleya* Nees. *Wikstroemia* Schrad. was not listed. This may be accounted for in part, possibly, by the fact that *Wikstroemia* Endlicher of the Thymelaeaceae had appeared on the conserved list many years earlier. However, there seems to be no reason for the oversight considering the fact that previous publicity had been given Schrader's genus by Blake, Rehder and Sprague, and in all three cases in the interpretation of Rules of Nomenclature.

It was while reviewing Blake's paper and tracing his references, some of

them obscure and difficult to obtain, that I realized that the correct combination for Schrader's original species had never been made.

Because of the obscurity of the publications, I relate below in detail the circumstances concerning the early publications of the names *Wikstroemia fruticosa* Schrader and *Lindleya semiserrata* Nees.

In the short span of 33 days in the year 1821 the real story of the genus was unfolded. On May the fifth, 1821, Schrader, in *Göttingische gelehrten Anzeigen* (No. 72, p. 710), a publication which evidently appeared three times weekly, published the new genus *Wikstroemia*, and on the following page listed a single species *W. fruticosa*, spelled "fruticosa." This new binomial was based on a specimen (no. 15), collected by Prinz Maximilian von Neuwied in Brazil. The generic description was in Latin and as complete as any of the descriptions for members of the Theaceae at that time. There could be no questioning of the date since a date appeared on every leaf of the publication, varying, of course, with the time of publication.

In the same month, at Regensburg, on May the twenty-first, Nees, in volume 4 of *Flora*, known also as *Botanische Zeitung Regensburg* (no. 19, p. 299), published a new genus *Lindleya*, giving no specific name, however. Nees had received a duplicate set of the Brazilian plants collected by Prinz Maximilian von Neuwied. By an odd coincidence Nees based his new genus *Lindleya* on the same Neuwied number which Schrader had cited in his publication of approximately two weeks earlier.

It may be assumed that Nees saw Schrader's publication of May 5, 1821, very shortly after it appeared, for on June 7 Nees (*Flora* vol. 4, p. 328) listed the combination *Lindleya semiserrata*, but merely as a synonym of *Wikstroemia fruticosa*. He mentioned that his own work on the collection was in manuscript form and in the hands of the collector (Neuwied) at the time. He further stated that he would rescind his earlier abstract (presumably that of May 21, 1821), since its publication was antedated by that of Schrader. He wrote also that, since it would be very instructive to see just how he agreed or disagreed with Schrader's treatment, he would offer a bit of amusement for the readers of "Flora" by listing his synonyms along with the original names of Schrader.

There seem to have been approximately fifty numbers in the set of specimens worked over by Schrader. Nees' set was less complete, since he listed twelve numbers as missing from his set. Of the approximate thirty-five numbers which the two workers had in common, Nees offered synonyms for fifteen of Schrader's new species. Of course these synonyms of Nees were all actually new combinations. His manner of listing is as follows: "15. *Wikstroemia fruticosa* Schr. ist *Lindleya semiserrata* m."

Just what feeling existed between the botanists of that time is difficult to ascertain; also the circumstances regarding the publication of the identifications on the Prinz Maximilian von Neuwied collection. At any rate, in the same year, Sprengel, in *Vet. Akad. Handl.* Stockholm 1821: 167. 1821, published a second genus, *Wikstroemia* (Compositae), named after

the same Dr. J. E. Wikström. He ignored Schrader's genus of the same name, failing to mention its existence. A footnote by the editor drew attention to Schrader's earlier *Wikstroemia* but stated that it was understood to be merely a synonym of Nees' *Lindleya*. The exact month of the last-mentioned publication is not certain. However, the complete action involving this confusion in synonymy took place in less than eight months!

In the following year (1822) Humboldt, Bonpland & Kunth (Nov. Gen. Sp. Pl. 5: 207) introduced the genus *Laplacea*, the name now conserved by the "International Rules." The date printed in the front of the volume was 1821, which might have confused the issue even further. However, according to Barnhart in Bull. Torrey Bot. Club 29: 595. 1902, the date of publication has been ascertained as 1822, rather than 1821. The type-species was in no way involved by the creation of the genus *Laplacea*, since H. B. & K. described *L. speciosa* from Peru in their work, not the species under discussion. *Laplacea speciosa* was designated as the type of the genus when the generic name *Laplacea* was conserved.

Four years later (1826), Martius and Zuccarini in Nov. Gen. Sp. 1: 107, t. 66, entered still another name, *Haemocharis*, and used the binomial *H. semiserrata*. *Lindleya* Nees was reported in the synonymy of *Haemocharis*, but not the binomial *L. semiserrata*.

The next year (1827), Cambessedes, in St. Hilaire, Fl. Bras. Mer. 1: 300, accepted *Laplacea* and transferred thereto *Haemocharis semiserrata*, attributing the parenthetical authorship to Martius & Zuccarini. Since that time the species has been recorded under either *Laplacea* or *Haemocharis* with the specific name "semiserrata."

A detailed record of the synonymy of this species follows:

Laplacea fruticosa (Schrader) Kobuski, comb. nov.

Wikstroemia fruticosa Schrader in Götting. Gel. Anzeig. 1821 (71): 711. May 5, 1821; "fruticosa."—Pontin [Editor] in Vet. Akad. Handl. Stockholm 1821: 168. 1821, obs. in footnote.—Blake in Contrib. Gray Herb. 53: 39. 1918.

Lindleya semiserrata Nees in Flora 4(1): 328. June 7, 1821, nom. nud., as syn.

Haemocharis semiserrata (Nees) Martius & Zuccarini, Nov. Gen. Sp. 1: 107, t. 66. 1826.—Choisy in Mém. Soc. Phys. Hist. Nat. Genève 1: 144 (Mém. Ternstr. 56). 1855.—Szyszyłowicz in Nat. Pflanzenfam. III. 6: 185, 189. 1893.

Gordonia semiserrata (Nees) Sprengel, Syst. Veg. Cur. Post. 4(2): 260, 408. 1827.

Laplacea semiserrata (Nees) Cambessedes in St. Hilaire, Fl. Bras. Mer. 1: 300. 1827; in Mém. Mus. Genève 16: 407, t. 1, fig. A. 1828.—Spach, Hist. Nat. Veg. 4: 76. 1835.—Hooker in Curtis's Bot. Mag. 70: t. 4129. 1844.—Wawra in Martius, Fl. Bras. 12(1): 289. 1886.—Melchior in Nat. Pflanzenfam. ed. 2, 21: 136. 1925.

Laplacea inaequilatera Schott in Sprengel, Syst. Veg. Cur. Post. 4(2): App. 408. 1827.

Laplacea praemorsa Splitgerber in Hoeven & De Vries, Tijdschr. 9: 100. 1842; iter. ex Mohl, Bot. Zeit. 1: 95. 1843.

Laplacea camellioides Sonder in Linnaea 22: 549. 1849.

Haemocharis camellioides (Sonder) Kuntze, Rev. Gen. Pl. 1: 62. 1891.

Haemocharis praemorsa (Splitgerber) Kuntze, Rev. Gen. Pl. 1: 62. 1891.

Laplacea inaequalilatera Hooker & Jackson, Index Kew. 2: 30. 1894, sphalm.

Lindleya fruticosa Hooker & Jackson, Index Kew. 2: 89. 1894, lapsu.

This species is probably the largest and most widespread in all, the

genus. To date it has been recorded from Brazil, the Guianas, Colombia, Venezuela, Peru and Bolivia in South America, Panama and even up into Mexico. Of the last I am doubtful.

Also several varieties have been described under *Laplacea semiserrata*. Eventually a more detailed study will show whether these varieties are worthy of recognition. The brief study made so far causes the author to be skeptical of the true varietal lines, and with this in mind he is unwilling to make further new combinations until these entities are studied in relationship with the other described species of the genus.

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NEW PLANTS FROM NORTHEASTERN SONORA, MEXICO AND NOTES ON EXTENSIONS OF RANGE¹

STEPHEN S. WHITE

BEGINNING IN 1938 the writer spent four consecutive summers in northeastern Sonora, Mexico, principally in the region of the Río de Bavispe, collecting plants for the University of Michigan Botanical Gardens and the Arnold Arboretum of Harvard University. Although not particularly inaccessible this area has received practically no attention from botanists. The only previous collectors in this region, besides those of the Mexican Boundary Survey, were Hartmann and Lloyd, botanists of the Lumholtz Archeological Expedition, who collected along the route of travel from Bisbee, Arizona through the Sonoran towns of Fronteras, Oputo; Granados, Bacadéhuachi, Nácori and thence into Chihuahua. This expedition was in Sonora only about three months.

More than 4000 numbers were collected in northeastern Sonora by the writer and those who at different times accompanied him (LeRoy H. Harvey, Edwin A. Phillips and José Vera Santos). Among them are the following novelties as well as certain other species whose presence in the area represents a notable range extension. A detailed report on the collections as a whole is in preparation and will be published at a later date.

Ceterach Dalhousiae (Hook.) C. Chr.

In 1940 Edwin A. Phillips collected this little known fern in the Cañón de Bavispe, a few miles west of the village of Bavispe (*E. A. Phillips* 547). Northeastern Sonora must therefore be included in the peculiar range of this plant, formerly known only from southeastern Arizona, Abyssinia and the Himalayan region of Asia. Mr. Phillips also found in this same location *Asplenium exiguum* Bedd. (*E. A. Phillips* 550), which has a similar distribution but which had been collected previously in northern Mexico.

Populus monticola Brandeg.

Originally described from Baja California, this tree was later collected by Palmer at Guaymas, Sonora. The writer's collection (*S. S. White* 691) from Arroyo del Pulpito, north of Colonia Oaxaca, probably represents the northern limit of the species, since this point is only about 60 miles south of the United States border, where it is unknown.

Ostrya virginiana (Mill.) Koch.

C. H. and M. T. Muller have collected this species in Nuevo León, but

¹ Papers from the Department of Botany and Botanical Gardens of the University of Michigan, No. 843.

the writer has seen no record of its presence in western Mexico, except the recent report by Gentry² who collected it in the Sierra Surotato in northern Sinaloa. The writer found it in the Sierra de El Tigre, Sonora, growing with walnut, sycamore, ash, maple and oak (*S. S. White* 583, 605, 3388, 3504). This wide-spread tree of eastern North America thus has at least two isolated outposts on the Pacific watershed, separated by a distance of 500 miles or more from the nearest eastern station.

Undoubtedly *Ostrya* in Sonora and Sinaloa is a relic of Miocene and Pliocene times when *O. oregoniana* Cheney (considered to be identical with or hardly distinguishable from *O. virginiana*) flourished in the north-western United States; at present it is not possible to tell, however, whether *O. oregoniana* ranged as far south as Sonora and Sinaloa, or whether *O. virginiana* extended westward to these localities through southern United States or northern Mexico.

Phacelia heterophylla Pursh var. *sonorensis* var. nov.

Herba perennis, robusta, erecta, 15–30 cm. alta, ubique canescenter hispida et glandulosi-pubescent. Folia breve petiolata, ovata, majora 5 cm. longa et 2.5 cm. lata. Corolla albida.

TYPUS: *S. S. White* 4641, "Puerto del Cumarito, Sierra de la Cabellera, Sonora, Mexico," in Herbario Universitatis Michiganensis.

This variety differs from the typical form of the species in being densely, although minutely, glandular in all its parts except the corolla and internal floral organs; the leaves are also smaller and generally lack the one or two small leaflets which are commonly present in *P. heterophylla*.

The type was collected at an elevation of 5400 feet in an oak-grassland association. The Sierra de la Cabellera lies north of the Río de Bavispe and west of the Sierra del Púlpio.

Pentstemon campanulatus (Cav.) Willd. var. *subglandulosus* var. nov.

Herba erecta, perennis, 60 cm. alta. Folia elliptica, acuta, in specimine typico majora 7 cm. longa et 2 cm. lata, inferiora petiolata, superiora sessilia, ab media parte ad apicem grosse serrata vel serrulata, floralia integra.

TYPUS: *S. S. White* 2645, "Cañón de Huépari, Sonora, Mexico," in Herbario Universitatis Michiganensis.

This variety differs markedly in aspect from *P. campanulatus*, but except for the size and shape of the leaves the only other significant difference noted is in the distribution of the glandular hairs. In the variety they are confined to the calyx and pedicels, but in the typical form of the species these parts as well as the corolla, peduncles, upper portion of the stem and even the upper leaves are often copiously glandular-pubescent.

The type locality lies midway between the towns of Oputo and Huachinera at an elevation of 4300 feet. The vegetation is oak-grassland.

² GENTRY, HOWARD SCOTT. Notes on the vegetation of Sierra Surotato in northern Sinaloa. *Bull. Torrey Bot. Club* 73: 451–462, f. 1–5, 1946.

Lonicera cerviculata sp. nov.

Frutex 2 m. altus, ramis glabris, juvenilibus purpurei-glaucis, deinde flavescentibus et nitidis. Folia oblongi-ovata, supra glabra, subtus puberula et perspicue glauca, basi truncata, apice obtusa vel subacuta, 4–8.5 cm. longa, latitudine circiter $\frac{3}{4}$ longitudinis. Dua vel tria summa paria foliorum perfoliata, oblonga, alia breviter petiolata, estipulata. Inflorescentiae spicatae, 1–3 terminales et aliae axillares solitariae in axillis paenultimi paris foliorum. Flores verticillati, a bracteis exterioribus 2 mm. longis et interioribus vix 1 mm. longis subtendentes. Calycis pars supra ovarium constricta 1 mm. longa, glauca, lobulis 5 ovatis vix 1 mm. longis. Corolla 12–14 mm. longa, aurantiaca vel rubella, siccitate flava, subventricosa, intus et extus glabra, lobulis 5 aequalibus. Stamina filamenta 1 mm. longa; antherae 2 mm. longae. Ovarium 3-loculatum, stylo glaberrimo in tubo corollae incluso. Fructus globosus, 4–5 mm. crassus, in tubulum calycis desinens. Semina 1–6, albida, compressa, ovoidea, foveolata, 3–4 mm. longa et ca. 2 mm. lata.

TYPUS: S. S. White 3422, "Las Tierritas de El Temblor, Sierra de El Tigre, Sonora, Mexico," in Herbario Universitatis Michiganensis.

This species belongs to the subgenus *Periclymenum* L. and to Rehder's subsection *Phenianthi*³, although its flowers are much smaller than those of other members of this group.

Besides the type the writer also refers to this species his collections 2832, 3934, 4195 and 4277, all of which, with the exception of 3934, are from the Sierra de El Tigre, not far from the type locality. The other specimen was found at Rancho de la Nacha, northeast of Nacozari. These have at times a single terminal spike and no axillary spikes; in some there is only one pair of connate leaves. In none of the specimens cited are any spikes to be found in the axils of the third pair of leaves, even when this pair is connate.

The name of this species refers to the neck-like calyx-tube which persists on the fruit, preserving the same size and shape that it had in flower. Its habitat is the pine-oak vegetational zone at elevations of 4500 to 6000 feet.

Lonicera cerviculata may be distinguished from *L. arizonica* Rehd., apparently its nearest relative, by its smaller flowers, elongate rather than capitate spikes, and the lack of ciliate hairs on the leaf margin.

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³ REHDER, ALFRED. Synopsis of the genus *Lonicera*. Rep. Missouri Bot. Gard. 14: 27–232, pl. 1–20. 1903.

NOTES ON THE ASIATIC FLORA

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A NEW SPECIES OF SCROPHULARIA FROM UPPER BURMA

IN A STUDY of the genus *Scrophularia* of China, it is noted that in the alpine regions of western China and adjacent areas there occur many endemic species of very limited range. Continuous to western Yunnan in Upper Burma there appears an apparently new species which is herein described. The material is based on the collections of the herbarium of the New York Botanical Garden.

Scrophularia birmanica sp. nov.

Planta nana, 15–18 cm. alta, caulibus simplicibus glabris, erectis, basi squamosis, rhizomate lignoso longo crasso 6–7 cm. longo; foliis oppositis breviter petiolatis, petiolis ad 2–3 mm. longis, subalatis margine ciliatis, lamina ovata, ad 2.5 cm. longa et 1.8 cm. lata, apice acuta, basi rotundata vel subcordata, margine irregulariter acute crenato-serrata, foliis in sicco chartaceis utrinque glabris, reticulo nervorum subtus conspicuo; inflorescentiis in verticillastris 1–2 densis multifloris aggregatis, pedicellis erectis 3–5 mm. longis glabris; bracteis lanceolatis 4–5 mm. longis, calycibus 6–7 mm. longis glabris ad $2/3$ lobatis, subobliquis, lobis oblongis obtusis vel rotundatis, extus parce puberulis; corolla flava 1.5 cm. longa, 4–5 mm. lata, intus villosa, extus glabra, tubo fere cylindrico, 8–10 mm. longo; lobo summo 5–7 mm. longo, alte bilobo, lobis rotundatis, lobis lateralibus et lobo antico 2–3 mm. longis rotundatis, erectis; staminibus inclusis, filamentis parce pubescentibus; staminodio reniformi; stylo glabro, 5 mm. longo; ovario glabro; capsula ignota.

Type, on stony alpine meadows, at altitudes of 3660–4020 meters, on western flank of N'Maika-Salwin divide, Upper Burma, collected in flower, June, 1925, by G. Forrest, no. 26859; holotype in the herbarium of the New York Botanical Garden.

UPPER BURMA: Western flank of N'Maika-Salwin divide, G. Forrest 26859, 27308, in the herbarium of the New York Botanical Garden.

This species is related to *S. Delavayi* Franch. of northwestern Yunnan, differing in being of smaller size, with smaller and shorter petiolate leaves, rounded calyx-lobes, and narrower corolla.

THE GENUS DIPHYLLEIA

The genus *Diphylleia* of the Berberidaceae is of particular interest because of its phylogenetic and distributional significance. Like other perennial herbaceous genera of the family, such as *Podophyllum*, *Jeffersonia*, *Caulophyllum*, and *Achlys*, it deviates from ordinary dicotyledons in having irregularly arranged vascular bundles in the stem. These

genera are somewhat similar in habit and habitat. They are small genera with only a few species, and these occur in discontinuous areas in eastern Asia and North America, each occupying a more or less limited range. These plants are geophilous herbs with well-developed rootstocks and a few large palmately-lobed leaves. Most of them grow on mountain slopes at fairly high altitudes as undergrowth in deciduous forests, usually in association with certain genera of the Ranunculaceae like *Cimicifuga*, *Trautvetteria*, etc.

The range of *Diphylleia*, like that of *Podophyllum*, *Jeffersonia*, and *Caulophyllum*, is discontinuous in two widely separated regions, namely, eastern Asia and eastern North America. In eastern North America the genus is found only in a very limited area in the Blue Ridge from Georgia to Virginia at altitudes from about 1000 to 1650 meters. In eastern Asia there are two separate areas. One is in the alpine regions from central Japan northward to Sakhalin and in the Amur region on the continent. The other is in central and western China, attaining an altitude of 3700 meters. The taxonomy of the genus as it occurs in these three separate areas is in need of clarification.

The American species is *D. cymosa* Michx. The plant that is found in insular and maritime northeastern Asia from central Japan to Sakhalin and the Amur region is known as *D. Grayi* F. Schmidt. Diels (Bot. Jahrb. 29: 336-337. 1900) recorded the genus as occurring in central China in Hupeh province and named the plant *D. cymosa* Michx. He considered the genus to be monotypic, and consequently the Japanese *D. Grayi* was reduced to varietal standing. Kumazuwa (Jour. Fac. Sci. Univ. Tokyo III. Bot. 2: 346-380, f. 1-20. 1930), in outlining the range of the genus, considered *D. Grayi* as limited to Japan, and *D. cymosa* as being found in eastern Siberia and central China, as well as in North America. It is uncertain whether his conclusion was authenticated by actual specimens or whether it was based on earlier records like that of Diels.

On studying all available specimens of the genus from America, China, and Japan, I am convinced that at least three species are recognizable, one in eastern North America and two in eastern Asia. The insular Asiatic plant found in Japan and Sakhalin is distinct from the plant found in China in Hupeh, Szechuan, and Yunnan, and this fact is substantiated by many specimens from both regions. Numerous specimens from eastern North America have also been observed, and they prove to be of a single species. No specimen has been seen from eastern Siberia. Thus it is impossible to say whether the plant from the Amur region is the same as the insular species or the central-western Chinese species. From the point of geographical proximity it is more likely to be identical with the former than with the latter. There is also the possibility that it is a distinct species or variety. The Chinese species, hitherto unnamed, is described as follows:

Diphylleia sinensis sp. nov.

Planta perennis, rhizoma crassum, radicibus parvis teretibus, fibrosis;

caulibus singulis, carnosus, 60–90 cm. altis, leviter puberulis; foliis singulis vel pluribus, longe petiolatis; petiolis ad 45 cm. longis, leviter puberulis; lamina palmata, rotundata, apice ad medium lobata, ad 15–20 cm. longa, 20–30 cm. lata, margine distanter et valde inconspicue dentata, dentibus acutis, 10–25; inflorescentiis terminalibus, singulis vel raro paribus, elongatis, cymosis, ramis iterum dichotomis vel raro simplicibus; pedicellis 5–25 mm. longis; petalis 5, ovatis vel obovatis, circiter 6 mm. longis et 4 mm. latis, subrotundatis; staminibus inclusis, filamentis crassis, 2 mm. longis, antheris elongatis, 2 mm. longis; ovariis ovoideis, 2 mm. longis; fructu subsphaerico, circiter 8–9 mm. diametro, glabro.

CHINA. Szechuan: western Szechuan, *E. H. Wilson 814* (TYPE), July and August, 1908. Hupeh: *A. Henry 6820*. Yunnan: Mount Fu-chuan, southwest of Wei-hsi, Mekong-Salween divide, *J. F. Rock 16971*, May-June 1928, in shade of fir forest, alt. 3700 m.

Wilson 814 bears both flowers and fruits. The other two collections are fruiting materials only. The specimens are all in the Gray Herbarium.

The American species, *D. cymosa* Michx., differs from both Asiatic species in that the leaves are more deeply lobed, with the lobes pointed, and the inflorescence is glabrous. The two Asiatic species have more shallowly lobed leaves and puberulous inflorescences. The leaves of the insular species, *D. Grayi* Schmidt, are intermediate between the American *D. cymosa* and the Chinese *D. sinensis*. They are less deeply lobed than in the former but more so than in the latter. The Japanese plant further differs from the Chinese plant in its more glabrous leaves, its sessile or subsessile terminal leaf, its more branched inflorescence, its larger petals and larger fruits. In *D. Grayi*, the Japanese species, the inflorescence rises at the exact base of the blade of the subtending leaf. In the Chinese plant the inflorescence rises on the leaf stalk at a point about 5 to 8 cm. below the leaf-blade. In this respect the American and Chinese species are similar, while the geographically intervening Japanese species stands out as different from both.

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NOTES ON SOME CULTIVATED TREES AND SHRUBS, VI

ALFRED REHDER

Euonymus Fortunei (Turcz.) Handel-Mazzetti f. *kewensis* (Bean), comb. nov.*Euonymus radicans* var. *kewensis* Hort. ex Bean, Trees Shrubs Brit. Isl. 1: 542 (1914). — [V. Gibbs] in Aldenham House Gard. List Surpl. Pl. 18 (1929), nom. subnud.; exclud. syn.*Evonymus kewensis* Hort. ex H. A. Hesse in Möller's Deutsch. Gärtn.-Zeit. 47: 217, fig. (1932).

This form has usually been referred as a synonym to *E. radicans* f. *minima* which it resembles in habit and general character, but its leaves are even smaller, being only 5–8 mm. long, while in f. *minima* they are 8–15 mm. long.

Aesculus Wilsonii Rehder in Sargent, Pl. Wilson. 1: 498 (1913).*Aesculus chinensis* sensu Diels in Bot. Jahrb. 29: 450 (1900), non Bunge (1833).*Actinotinus sinensis* Oliver in Hooker's Icon. Pl. 18: t. 1740 (1887); 19: corrective note inserted before t. 1851 (1889, June). — Hemsley in Gard. For. 2: 124 (1889, March). — Pro parte, quoad folia; quoad flores = *Viburnum plicatum* f. *tomentosum* (Thunb.) Rehd.

In the corrective note cited above, it is stated that *Actinotinus sinensis* is based upon a trick played by one of Dr. Henry's collectors, and is made up of the inflorescence of a *Viburnum* inserted into the terminal bud of *Aesculus chinensis*. The specific name of the *Viburnum* is not given and that of *Aesculus* is not quite correct. There can be no doubt, however, that the inflorescence represents *V. plicatum* Thunb. f. *tomentosum* (Thunb.) Rehder in Jour. Arnold Arb. 26: 77 (1945), better known as *V. tomentosum* Thunb., a name unfortunately invalidated by the earlier homonym of Lamarck (1778). The leaves agree perfectly with *A. Wilsonii* Rehd., the only representative of the genus *Aesculus* in Western China. In the same region *V. plicatum* f. *tomentosum* is found, so that material of both species could have been collected at the same time and put together to create this fake specimen.

Phillyrea latifolia var. *media* f. *pendula* (Ait.), comb. nov.*Phillyrea media* γ *pendula* Aiton, Hort. Kew. 1: 11 (1789). — Rehder in Bailey, Stand. Cycl. Hort. 5: 2583 (1916) "var."*Phillyrea pendula* Willdenow, Enum. Pl. Hort. Berol. 12 (1809). — Link in Jahrb. Gewächsk. 1, 1: 159 [1818]. — Loudon, Arb. Brit. 2: 1204 (1838) "*P. (m.) pendula*."

It is doubtful if this form is still in cultivation; I have seen neither a living plant nor a recent reference to one, nor an herbarium specimen of it.

Viburnum lantanoides f. *praecox* (Kache), grad. nov.*Viburnum lantanoides praecox* Kache in Gartenwelt, 16: 496, fig. (1912, Sept.).

Viburnum alnifolium (f.) *praecox* Hesse in Mitt. Deutsche Dendr. Ges. 1912(21): 371, fig. [1913].

This form differs chiefly in its flowering time which is about three weeks earlier than in the typical form.

The specific name *V. lantanoides* Michx. had been universally used as the valid name for this species until in 1898 Britton in Britton & Brown (Ill. Fl. N. U. S. 3: 229) took up the name *V. alnifolium* Marshall of 1785 and was followed by a number of botanists. Marshall's plant, however, represents only partly a *Viburnum*; it is based on Miller's *Viburnum americanum* (Gard. Dict. ed. 8, V. no. 8. 1768) which is mainly referable to *Hydrangea arborescens* L. This is further confirmed by a specimen of Miller's *V. americanum* in the British Museum which according to S. F. Blake in Rhodora, 20: 14 (1918) is *Hydrangea arborescens* L. The description of *V. alnifolium* Marshall is an almost verbatim copy of Miller's description without any additional new character which would indicate that Marshall did not know much of the plant he was describing, and as in almost all other cases, he does not give any reference to the author of the name. See also Mackenzie in Torreya, 27: 81-83 (1927).

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.

THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1947

DURING THE PAST YEAR many changes have occurred at the Arnold Arboretum. Dr. Merrill retired as Director on reaching the age of 70, but remains as Arnold Professor of Botany. Mr. E. J. Palmer retired at the age of 73, but will remain another year for a special part-time project. Dr. Leon Croizat and Mr. Vladimir Asmous resigned during the year. Dr. Charlotte G. Nast, Curator of the Wood Collections, left to accept a teaching position. None of the resulting vacancies has been filled. We have, however, appointed Mr. Richard Fillmore to succeed the late Mr. Judd as Propagator. Mrs. Beatrix Farrand continues to serve as Consulting Landscape Gardener.

Horticultural Activities.—During the past year nearly 4,000 man days have been spent on the grounds. The major project has been the removal of duplicate and overcrowded plants—a total of more than a thousand. Some of the extra shrubs were moved to nursery rows at the Case estate in Weston. The larger trees were cut up for fire-wood which we hope will pay for some of the costs.

Some new plantings have been made around the Administration Building where we plan to feature the introductions and new hybrids introduced by the Arnold Arboretum. A planting of ground-covers along the road will be extended along the meadow as funds permit.

The opening of vistas and opening up of overcrowded areas, as well as the new plantings has been done in accord with the suggestions of our consulting landscape gardener, Mrs. Beatrix Farrand.

During the current year 155 species and varieties of plants were propagated. We received 267 species or varieties from other institutions and distributed 283.

Photographs in natural color are made for records and for display. There is a need also for black and white prints for use in publications. We have few good pictures for such purposes.

The National Shade Tree Conference, attended by over 500 delegates, held its field demonstration in the Arnold Arboretum last summer.

The Case Estate in Weston has proved to be a valuable adjunct to the Arboretum. Miss Louisa Case died in the fall of 1946 and left additional land and buildings to the Arboretum, together with farm equipment and a substantial endowment. Approximately 46 acres of land were sold to the town of Weston for school purposes, but 145 acres remain in the Case Estates. Most of this land is suitable for experimental work.

Semi-permanent plantings of *Ribes* and *Berberis* have been started at the Case Estate together with other species which should not be given

valuable display space at the Arnold Arboretum proper. Various experimental work has been started on cultural practices and fertilizers. Some of the Bussey Institution and Cabot Foundation work is being done at Weston. The Department of Landscape Architecture of Harvard University has been given the use of an area for demonstration work.

Both at the Arnold Arboretum and at the Case Estates in Weston we are using more mechanized equipment. Power mowers, cultivators, and saws permit more work with fewer men. Weed-killing sprays, flame throwers, and a mulch of spent hops are used to control weeds with a minimum of hand labor.

The plant breeding program is beginning to pay dividends in new varieties of ornamental plants. Last spring two new forsythias, Arnold Giant and Arnold Dwarf were distributed to cooperating nurserymen. Arnold Giant is a tetraploid form of *Forsythia intermedia* produced by colchicine treatment. Arnold Dwarf is a delicate dwarf forsythia produced by species hybridization. Next spring we shall distribute a new dwarf flowering cherry of exceptional merit.

Cytogenetic studies of *Sorbus-Aronia* hybrids have aided in determining the relationships of these genera. Grafting experiments in the Pomoideae and in *Prunus* have proved to be of theoretical interest and of possible economic value. The common lilacs budded on tree lilacs continue to make good growth. This should result in our being able to grow the common lilac free of root suckers.

Comparative Morphology.—Professor Bailey has continued his investigations of the comparative morphology of various dicotyledonous families, with special emphasis upon salient trends of structural specialization in carpels. Dr. B. G. L. Swamy, a Government of India Fellow, is making a comprehensive study of the Saxifragaceae and related families. Mr. James E. Canright of the Magnoliaceae, and Mr. R. W. Vander Wyk of the Annonaceae. Mr. William Spackman, Jr., is continuing his investigations of dicotyledonous woods, with special reference to problems of identifying Mesozoic and Tertiary fossils. The work in comparative morphology has been seriously handicapped during the year by the loss of Dr. Charlotte G. Nast, Curator of the Wood Collections, who has accepted a position at the Nebraska State Teachers College at a much higher salary.

Taxonomy.—Dr. Merrill has continued his taxonomic and bibliographic work and completed his Index Rafinesquianus. His extensive Botanical Bibliography of the islands of the Pacific was published by the Smithsonian Institution early in 1947. During the year he was honored by election to foreign membership in the Royal Society of Edinburgh, the Royal Swedish Academy of Sciences, and was appointed as honorary collaborator of the Botanical Garden, Buitenzorg, Java. He also received the George Robert White medal of honor from the Massachusetts Horticultural Society in appreciation of his services to horticulture.

During the past year Professor Rehder completed his bibliography of cultivated trees and shrubs, and part of this work is now in proof. The catalogue begun by Professor Rehder, containing all available references in the periodical literature useful in the classification and identification of woody plants, now contains 144,551 cards — an increase of 3,526 during the past year.

Professor Johnston has worked on the flora of Panama, and has completed a study of the plants of San José Island. Professor Raup's "Botany of the southwestern Mackenzie" has been published in Sargentia. Dr. Smith completed a study of *Illicium*, *Schisandra* and *Kadsura* before he left, in late February, for a year of field work in Fiji. Dr. Kobuski has been busy with editorial and curatorial duties, but is continuing his work on the Theaceae. Mr. Palmer is working on *Crataegus* and *Quercus*. Dr. Perry is studying the Papuan collections made during the Richard Archbold Expeditions, while Dr. Allen is continuing work on South American Lauraceae. Dr. Frans Verdoorn is working on his Index Botanicorum, to which more than 120,000 references were added during the year.

The herbarium now contains 626,999 specimens. A total of 35,898 specimens were received by exchange, purchase or for identification. The Arboretum sent 13,046 specimens to other institutions.

The Library. — At the end of the fiscal year the library contained 46,520 bound volumes, 200 unbound volumes, and about 14,000 pamphlets. Through the Interlibrary loan system we loaned 137 volumes in addition to 435 volumes to other Harvard libraries. We borrowed 188 volumes from other libraries, including those of Harvard.

Several exhibits of our rare books were on display for the Visiting Committee, various Garden Clubs and the Massachusetts Horticultural Society visitors. With the end of the war the flow of visitors and students has increased greatly.

Among outstanding gifts were a Gazetteer of Chinese Place Names from the Army Map Service, and six volumes of Backer's Flora of Java, a gift from Dr. Verdoorn.

Financial Report. — Endowment funds received last year included \$55,464.91 from the Marion Roby Case estate, \$10,350.00 from the J. B. Case Fund, by sale of property to the town of Weston, \$150,000.00 from the Katherine T. Balch bequest and contributions to the Judd Memorial Fund, amounting to \$2,862.50 — a total of \$218,577.41 for the fiscal year. In addition funds for current use totaled \$4,970.25, including \$2,320.00 for cultural purposes, a grant of \$500.00 from the Bache Fund of the National Academy for Dr. Merrill's work, and a grant of \$600.00 from the same fund to Dr. A. C. Smith. Harrison W. Smith contributed \$1,500.00 for Chinese exploration work, and the publication fund was increased by \$50.25.

The total income for the year was \$152,409.43, while expenses amounted to \$170,914.89, leaving an apparent deficit of \$18,505.46. The deficit was covered by drawing on a credit balance built up during the war years, and by drawing on contributions for cultural purposes which had also accumulated during the war years.

The endowment of the Arnold Arboretum has increased more than three-fold since Sargent's administration, yet the labor and scientific personnel has not been increased materially. Costs of labor, equipment, and materials have increased almost as rapidly as has the income from endowment. The income from endowment is adequate for routine maintenance, and present projects, but new major projects must be financed by annual or special gifts.

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KARL SAX,
Director

Staff of the Arnold Arboretum

1946 — 47

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INDEX

Synonyms are printed in *italics*; new names in bold-face type.

- Acmpyle, A Fijian, 141
 Acmpyle Pancheri, 141, 142
 — Sahniana, 142
 Acranthera Arn. ex Meisn. (Rubiaceae),
 A Monograph of the Genus, 261
 Acranthera. 278
 — ser. *Ciliolatae*, 297, 298
 — ser. *Iteophyllae*, 298, 301
 — ser. *Monopodiales*, 287, 291
 — ser. *Philippinenses*, 298, 300
 — ser. *Sympodiales*, 287
 — ser. *Umbelliflorae*, 298, 302
 — subgen. *Ablepharidesma*, 280, 295
 — subgen. *Amphoterosanthus*, 279, 283
 — subgen. *Androtropis*, 279, 281
 — subgen. *Athroopheps*, 280, 304
 — subgen. *Cleomocarpus*, 279, 282
 — subgen. *Dichroanthes*, 280, 286
 — subgen. *Eu-acranthera*, 279, 280
 — subgen. *Mitracme*, 280, 297
 — subgen. *Phanerochiton*, 280, 285
 — abbreviata, 287, 294
 — anamallica, 280
 — *athroophebia*, 305
 — atropella, 298, 304
 — *aurantiaca*, 287, 291
 — axilliflora, 287, 294
 — bullata, 287, 288
 — capitata, 305, 306
 — ceylanica, 280, 281
 — **Endertii**, 296
 — frutescens, 298, 299
 — grandiflora, 280
 — Hallierii, 298, 303
 — hirtistipula, 287, 295
 — involucrata, 285
 — Johannis-Winkleri, 287, 289
 — lanceolata, 298, 301
 — longipes, 284
 — *longipes*, 293
 — longipetiolata, 287, 293
 — maculata, 287, 295
 — megaphylla, 287, 292
 — monantha, 287, 290
 — Nieuwenhuisii, 298, 302
 — ophiorrhizoides, 283
 — parviflora, 296
 — philippinensis, 298, 301
 Acranthera **Ruttenii**, 305, 307
 — *salmonea*, 287, 292
 — *siamensis*, 281
 — *siliquosa*, 282
 — *simalurensis*, 285
 — tomentosa, 281
 — variegata, 287, 290
 — *velutinervia*, 297, 298
 — Yatesii, 284
 — *zeylanica*, 281
Actinotinus sinensis, 445
 Adenandra, 1
 Adiantum andicola, 310
 — Capillus-veneris, 313
 — latifolium, 313
 — subcordatum, 313
 Adinandra, Studies in the Theaceae, XV.
 A Review of the Genus, 1
 Adinandra, 3
 — sect. *Eleutherandra*, 2
 — sect. *Eleutherostyla*, 2
 — sect. *Euadinandra*, 2
 — sect. *Symphianandra*, 2
 — acuminata, 51, 73
 — *acutifolia*, 17
 — angulata, 50, 61
 — annamensis, 31
 — apoensis, 35, 43
 — *bancana*, 93
 — bicuspidata, 90
 — Bockiana, 10, 16
 — — *acutifolia*, 10, 17
 — — *tonkinensis*, 18
 — borneensis, 51, 81
 — *bracteata*, 33
 — Brassii, 97
 — Brefeldii, 91
 — caudata, 31
 — caudatifolia, 51, 72
 — celebica, 91
 — *chinensis*, 19
 — *Chingii*, 33
 — Clemensiae, 51, 77
 — coarctata, 52, 86
 — collina, 51, 76
 — colombonensis, 49, 59
 — cordata, 93
 — cordifolia, 50, 65

Adinandra cordifolia strigosa, 50, 66

- *coriacea*, 40
- *Corneriana*, 51, 71
- *crenulata*, 92
- *cyrtopoda*, 55
- *dasyantha*, 51, 82
- *dasyantha*, 75
- *donnaiensis*, 32
- *Drakeana*, 11
- *dumosa*, 49, 55
- *dumosa*, 36
- *elliptica*, 35, 36
- *epunctata*, 11, 25
- *excelsa*, 50, 59
- *filipes*, 11, 22
- *Forbesii*, 96
- *formosana*, 14
- *glabra*, 55
- *glischroloma*, 11, 19
- — *hirta*, 21
- — *jubata*, 21
- — *macrosepala*, 11, 20
- *Griffithii*, 49, 52
- *hainanensis*, 11, 22
- *hainanensis*, 22
- *Hemsleyi*, 12
- *hirta*, 21
- *Howii*, 11, 28
- *Hullettii*, 50, 68
- *hypochlora*, 15
- *impressa*, 49, 54
- *integerrima*, 51, 75
- *integerrima*, 36, 87
- — *nigro-punctata*, 75
- — *phlebophylla*, 87
- — *villosa*, 89
- *Jackiana*, 55
- *javanica*, 51, 84
- *jubata*, 21
- *kweichovensis*, 32
- *lamponga*, 62
- *laotica*, 11, 26
- *lasiopetala*, 49, 54
- *lasiostyla*, 11, 24
- *leiopetala*, 63
- *leytensis*, 35, 41
- *Loheri*, 35, 40
- *lutescens*, 51, 84
- *luzonica*, 35
- *Macgregorii*, 35, 38
- *Maclurei*, 22
- *macrantha*, 62
- *macrosepala*, 20
- *maculosa*, 50, 69
- *magniflora*, 51, 79
- *Mannii*, 94

Adinandra maquilingsensis, 35, 39

- *megaphylla*, 10, 18
- *Merrillii*, 43
- *Millettii*, 18, 19
- *Millettii*, 10, 11
- — *formosana*, 10, 14
- — *obtusissima*, 11, 15
- *Miquelii*, 93
- *montana*, 44, 67
- *myrioneura*, 51, 83
- *nigro-punctata*, 35, 42
- *nitida*, 11, 27
- *nunkokensis*, 50, 70
- *oblonga*, 51, 85
- *obscurinervia*, 33
- *obtusissima*, 11, 30
- *parvifolia*, 50, 67
- *pedunculata*, 15
- *Petelotii*, 18
- *phlebophylla*, 52, 87
- *plagiobasis*, 51, 80
- *polyneura*, 50, 60
- *quinquepartita*, 49, 53
- *Robinsonii*, 36
- *rostrata*, 40
- *rubropunctata*, 22
- *ryukyuensis*, 11, 29
- *Sarosanthra*, 50, 62
- *Schliebenii*, 95
- *serrulata*, 18
- *stenosepala*, 33
- *stylosa*, 55
- *subsessilis*, 50, 66
- *sylvestris*, 93
- *trichocoryna*, 55
- — *cyrtopoda*, 56
- — *glabra*, 55
- — *parvifolia*, 55
- — *stylosa*, 56
- *urdanetensis*, 46
- *verrucosa*, 49, 58
- *villosa*, 52, 88
- *yaeyamensis*, 10, 30
- *Zen-Tasiroi*, 11, 29
- Aesculus chinensis*, 445
- *Wilsonii*, 445
- Agnus castus incisa*, 258
- — — *multifida*, 258
- Agrostemma Githago*, 414
- Agrostis alba vulgaris*, 412
- *stolonifera compacta*, 412
- Alopecurus carolinianus*, 412
- *geniculatus*, 412
- Amaranthus hybridus*, 414
- — *hypochondriacus*, 414
- Amelanchier asiatica*, 139

- Amelanchier florida*, 138
 — *sp.*, 139
Amelasorbus Hoseri, 139
 — *Jackii*, 138
 — *Raciborskiana*, 139
Anacharis occidentalis, 411
Andropogon dulce, 227
 — *scoparius*, 412
Androtropis tomentosa, 281
Anemia cheilanthoides, 310
 — *fulva*, 310
 — *hirsuta*, 313
 — *Phyllitidis*, 310
 — *tomentosa*, 310
Anemopaegma, 432
 — *grandifolium*, 432
Anogramma chaerophylla, 313
Antrophyum lanceolatum, 310
Anychia canadensis, 414
Aponogeton loriae, 419
Araucaria in New Guinea and a Proposed
 New Section of the Genus, Notes on
 Two Species of, 259
Araucaria sect. *Colymbea*, 260
 — sect. *Eutacta*, 260
 — sect. *Intermedia*, 260
 — *Cunninghamii*, 259
 — *Klinkii*, 260
Archboldiodendron, 2
 — *calosericea*, 2
Arenaria serpyllifolia, 414
Arnold Arboretum during the Fiscal Year
 Ended June 30, 1947, The, 447
Arnold Arboretum, Second Supplement
 to the Spontaneous Flora of the, 410
Arnold Arboretum, 1946-47, Staff of the,
 453
Aronia arbutifolia, 138
 — *floribunda*, 415
 — *melanocarpa*, 138
 — *prunifolia*, 137, 415
Asiatic Flora, Notes on the, 442
Asplenium malayo-alpinum, 313
 — *monanthes*, 313
 — — *Galeotti*, 313
Astelia novoguineensis, 419
Aster novi-belgii × *vimineus*, 418
 — *lateriflorus* × *paniculatus*, 418
Astragalus in Argentina, Bolivia and
 Chile, 336
Astragalus aconcaguensis, 351
 — *affinis*, 348
 — *alberjilla*, 381
 — *alfalfalis*, 383
 — *amatus*, 341, 376
 — *Ameghinoi*, 356
Astragalus amoenus, 408
 — *Amunategui*, 340, 362
 — *Amunateguianus*, 362
 — *araucanus*, 346
 — *arequipensis*, 342, 386
 — *argentinus*, 339, 360
 — *Arnottianus*, 339, 357
 — *Asplundii*, 340, 366
 — *atacamensis*, 396
 — *atuelii*, 355
 — *azureus*, 383
 — *Barceloi*, 356
 — *bellus*, 340, 366
 — *Benthamianus*, 384
 — *Bergii*, 341, 369
 — *Berteri*, 342, 381
 — *Berterianus*, 338, 350
 — *bicolor*, 408
 — *bolivianus*, 386
 — *brachycalyx*, 396
 — *brachypterus*, 376
 — *brachytropis*, 349
 — *brevicaulis*, 359
 — *Burkartii*, 340, 364
 — *Bustillosii*, 343, 396
 — *cachinalensis*, 341, 380
 — *canescens*, 350
 — — *Pissisi*, 347
 — *capitellus*, 390
 — *carinatus*, 341, 370
 — *cauquenensis*, 381
 — *Chamissonis*, 338, 345
 — *chilensis*, 346, 376
 — *chrysanthus*, 347
 — *chubutensis*, 340, 367
 — *clandestinus*, 365
 — — *Flossdorfii*, 365
 — *Closianus*, 383
 — *colliculus*, 404
 — *compactus*, 405
 — *complicatus*, 343, 389
 — *concinus*, 381
 — *confinis*, 344, 398
 — *coquimbensis*, 339, 352
 — *Cruckshanksii*, 340, 361
 — *crymophilus*, 344, 400
 — *cryptanthus*, 342, 387
 — *crypticus*, 340, 365
 — *cryptobotrys*, 340, 365
 — *Cuatrecasasi*, 407
 — *curvicaulis*, 339, 352
 — *Darumbium*, 339, 354
 — *deminutivus*, 345, 406
 — *depauperatus*, 396
 — *Dessaueri*, 383
 — *Dielsii*, 345, 407

- Astragalus dilectus*, 383
— *Dillinghami*, 344, 402
— *distans*, 368, 369
— *distinens*, 341, 368
— *Doddi*, 342, 380
— *dolichostachys*, 351
— *Domeykoanus*, 342, 388
— *drepanophorus*, 386
— *Duseni*, 359
— *Echegarayi*, 354
— *Edmonstonei*, 338, 347
— *elatus*, 352
— *elongatus*, 381
— *Famatinae*, 343, 393
— *ferrugineus*, 376
— *filifolius*, 381
— *flavocreatus*, 345, 405
— *flavus*, 347
— *Garbancillo*, 342, 384
— — *Mandoni*, 384
— *Germaini*, 342, 383
— — *azureus*, 383
— *Gilliesi*, 407
— *glaucophyllus*, 415
— *gracilis*, 407
— *grandis*, 353
— *gratus*, 381
— *Herzogii*, 397
— *Hieronymi*, 394
— *Hohenacheri*, 348
— *hurtadensis*, 408
— *hypsogetus*, 344, 399
— *Illinii*, 339, 360
— *infirmus*, 408
— *inflatus*, 353
— *Joergensenii*, 341, 372
— *laetevirens*, 346
— *Landbecki*, 361
— *lanuginosus*, 408
— *laxiflorus*, 351
— — *dissitiflora*, 351
— *leucomallus*, 376
— *limariensis*, 338, 348
— *litoreus*, 376
— *Looserii*, 338, 349
— *macrocarpus*, 353
— — *petiolatus*, 353
— *macrophysus*, 355
— — *robustus*, 355
— *Mandoni*, 384
— *maulensis*, 349
— *megalocarpus*, 353
— *melanogonatus*, 381
— *Meyenianus*, 356
— — *paucifoliolata*, 356
— *micranthellus*, 343, 390
— *Astragalus minimus*, 345, 404
— — *minor*, 384
— *minutissimus*, 345, 403
— *modestus*, 395
— *monospermus*, 346
— *Monteroi*, 341, 375
— *monticola*, 339, 356
— *Moyanoi*, 362
— — *villosula*, 360
— *nanus*, 358
— *nubigenus*, 356
— — *Arnottianus*, 356
— *nudus*, 342, 380
— *oblongifolius*, 350
— *ochroleucus*, 345
— *oliganthus*, 387
— *Orbignyianus*, 386
— *oreophilus*, 358
— *orites*, 388
— *orthocarpus*, 342, 387
— *ovallensis*, 346
— *palenae*, 339, 358
— — *Duseni*, 359
— — *grandiflora*, 359
— *pallens*, 358
— *paposanus*, 339, 351
— *Parodii*, 341, 371
— *patagonicus*, 340, 363
— *patancanus*, 390
— *pauranthus*, 341, 373
— *pehuenches*, 339, 353
— *pencanus*, 381
— *peruvianus*, 344, 402
— *Philippi*, 358
— *Philippianus*, 408
— *pictus*, 408
— *Pilgeri*, 395
— *Pissisi*, 338, 347
— *placens*, 346
— — *oblongifolius*, 350
— *procumbens*, 376
— *prostratus*, 381
— *pulchellus*, 367
— *pulviniformis*, 345, 404
— *punae*, 343, 389
— *punensis*, 395
— *pusillus*, 344, 400
— *quindecimjugas*, 409
— *Rahmeri*, 358
— *Reedii*, 357
— *Reichei*, 345, 404
— *Rengifoi*, 381
— — *lejocarpa*, 370
— *Rhudolphi*, 382
— *Ruiz-Lealii*, 341, 373
— *rupestris*, 356

Astragalus Sanctae-Crucis, 342, 387

— *San Romani*, 354

— *santiagensis*, 408

— *Segethi*, 383

— *sinocarpus*, 386

— *Spegazzinii*, 341, 370

— *sphaerocarpus*, 409

— *sphaerocarpus*, 350

— *striatus*, 353

— — *Echegarayi*, 354

— *subandinus*, 376

— *tarapacanus*, 396

— *tarijensis*, 343, 394

— *tehuelches*, 340, 367

— *tricolor*, 376

— *triflorus*, 343, 391

— *trifoliatus*, 379

— *uniflorus*, 343, 397

— *unifolius*, 384

— *Urbanianus*, 344, 401

— *vagus*, 339, 354

— *valerianensis*, 339, 354

— *valparadisiensis*, 341, 379

— *vasticola*, 352

— *Venturii*, 343, 398

— *verticillatus*, 338, 349

— *vesiculosus*, 339, 356

— *vicifolius*, 391

— *Volckmanni*, 346

— *Weddellianus*, 343, 395

— *Werdermanni*, 344, 403

Athyrium Dombei, 313

— *paucifrons*, 313

— *Skinneri*, 313

Atriplex patula, 414

Axyris amaranthoides, 414

Betula papyrifera, 413

Bibliography of the Published Writings
of the Staff and Students, July 1, 1946

— June 30, 1947, 450

Bidens vulgata puberula, 418

Bignonia grandifolia, 432

BLAKE, S. T. The Cyperaceae Collected
in New Guinea by L. J. Brass, I, II,
99, 207

Blechnum blechnoides, 310

— *fraxineum*, 313

— *occidentale*, 310, 314

— *orientale*, 314

— *unilaterale*, 310, 314

— *volubile*, 310

Bonnetia cubensis, 125

Botrychium virginianum, 313

Brandisia, Relationship and Taxonomy of
the Genus, 127

Brandisia Souliei Bonati, on the Identity
of, 251

Brandisia, 130

— subgen. *Coccineabotrys*, 131

— subgen. *Eubrandisia*, 131

— subgen. *Rhobrandisia*, 131

— *discolor*, 134

— *glabrescens*, 134

— *Hancei*, 132

— *kwangsiensis*, 133

— *laetevirens*, 133

— *pratensis*, 136

— *racemosa*, 135

— *rosea*, 135

— *Souliei*, 136

— *Souliei*, 252

— *Swinglei*, 133

Brass, I, II, The Cyperaceae Collected in
New Guinea by L. J., 99, 207

Brassica campestris, 414

— *juncea*, 415

BREMEKAMP, C.E.B. A Monograph of
the Genus *Acranthera* Arn. ex Meisn.
(Rubiaceae), 261

— A Monograph of the Genus *Pomazota*
Ridley (Rubiaceae), 186

— A Monograph of the Genus *Streblosa*
Korthals (Rubiaceae), 145

— *Siderobombyx* Brem. Nov. Gen. Rubi-
acearum *Hedyotidearum*, 204

Bromus arvensis, 411

Bruinsmia styracoides, 422

BUCHHOLZ, JOHN T. & NETTA E. GRAY.

A Fijian *Acmopyle*, 141

Bulbostylis barbata, 228

Buxus flaviramea, 126

Calyptranthes oblongifolia, 122

Camellia axillaris, 73

— *japonica*, 75

Campanula aparinoides, 417

Camptostemon philippinensis, 422

Carex subgen. *Eucarex*, 107

— subgen. *Indocarex*, 102

— subgen. *Primocarex*, 99

— subgen. *Vignea*, 101

— *acrophila*, 114

— *aestivalis*, 413

— *appressa*, 101

— *breviculmis*, 112

— — *Royleana*, 112

— *brevis*, 111

— *Brownii*, 115

— *brunnea*, 114

— *bulbostylis*, 109

— — *ciliato-marginata*, 110

— — *hispidula*, 111

— *canescens*, 413

— *capillacea*, 101

— *cephalantha*, 413

- Carex constricta*, 112
 — *continua*, 104
 — *curta*, 101
 — *Dietrichiae*, 102
 — *Doniana*, 115
 — *eremostachya*, 99
 — *euphlebia*, 108
 — *fascicularis*, 116
 — *Gaudichaudiana*, 107
 — *hystericina*, 413
 — *lamprochlamys*, 104
 — *laxiculmis*, 413
 — *melanophora*, 106
 — *montivaga*, 109
 — *neoguineensis*, 105
 — *perileia*, 102
 — *phacota*, 107
 — *Rafflesiana continua*, 104
 — *rara capillacea*, 101
 — *rhizomatosa*, 107
 — *scoparius moniliformis*, 413
 — *subtransversa*, 115
 — *tribuloides reducta*, 413
 — *tricholoma*, 110
 — *tricuspidata*, 113
 — *virescens*, 413
Carya sect. *Apocarya*, 254
 — sect. *Pacania*, 254
Cassia clarensis, 126
 — *insularis*, 126
Celtis occidentalis, 413
Cephaloscirpus macrocephalus, 212
Ceterach Dalhousiae, 439
Chamaecrista clarensis, 126
Chamaecyparis obtusa ericoides, 253
 — — *Sanderi*, 253
Chamaefistula insularis, 126
Cheilanthes membranacea, 314
 — *microphylla*, 314
 — *pyramidalis*, 310, 314
 — *tenuifolia*, 314
Chelonopsis albiflora, 252
 — *Souliei*, 252
Chenopodium Botrys, 414
 — *glaucum*, 414
 — *hybridum*, 414
 — *paganum*, 414
 Chinese Fagaceae, New and Noteworthy, 230
Chrysanthemum Parthenium, 418
 CHUN, WOON-YOUNG. New and Noteworthy Chinese Fagaceae, 230
 — & HSIANG-HAO HSUE. Notes on Chinese Sterculiaceae, 328
 — & YING TSIANG. A New Lactiferous Plant in South China, 245
 Chun, Woon-Young & Ying Tsiang. Species Novae Fagacearum Sinicarum, 320
Cichorium Intybus album, 418
Clematis virginiana, 414
Cleyera japonica, 33
 — — *lipingensis*, 33
 — — *montana*, 44
 — — *lasiopetala*, 54
 — *Millettii*, 11
Coniogramme fraxinea, 310, 314
Coptophyllum, 195
 — *bracteatum*, 201
 — *capitatum*, 198, 199, 201
 — *pilosum*, 200
Coreopsis major stellata, 418
Corydalis sempervirens, 414
Corynocarpus australasica, 421
Cosmos bipinnatus, 418
Cryptogramme japonica, 311
Cumingia philippinensis, 422
Cupressus pisifera Sanderi, 253
Cupulissa Raf. and *Platolaria* Raf., On the Identity of the Genera, 430
Cupulissa, 432
 — *grandifolia*, 432
Cuscuta arvensis, 417
 — *pentagona*, 417
Cyathea fulva, 313
 — *Harrisii*, 313
 — *mexicana*, 313
Cyclopeltis semicordata, 314
 Cyperaceae Collected in New Guinea by L. J. Brass, I, II, The, 99, 207
Cyperus, 213
 — subgen. *Eucyperus*, 213
 — subgen. *Juncellus*, 219
 — subgen. *Kyllinga*, 225
 — subgen. *Mariscus*, 221
 — subgen. *Pycneus*, 220
 — subgen. *Torulanium*, 226
 — *aquatilis*, 219
 — *auricomus*, 214
 — — *microstachyus*, 214
 — *brevifolius*, 225
 — — *stellulatus*, 225
 — *canescens*, 222
 — *Carrii*, 213
 — *cinereobrunneus*, 216
 — *compactus*, 221
 — — *decolorans*, 221
 — *cylindrostachys*, 224
 — *cyperoides*, 224
 — *diffusus*, 215
 — — *celebicus*, 215
 — — *macrostachyus*, 215
 — — *princeps*, 215

- Cyperus diffusus pubisquama*, 215
 — *digitatus*, 213
 — *dilutus*, 221
 — — *decolorans*, 221
 — *distans*, 214
 — *ferax*, 226
 — — *novae-hannoverae*, 226
 — *globosus*, 220
 — *Haspan*, 219
 — *Holoschoenus*, 223
 — — *fusci-squamatus*, 223
 — *Iria*, 214
 — *javanicus*, 222
 — *Kyllingia*, 225
 — — *humilis*, 225
 — — *subtriceps*, 225
 — *malaccensis*, 214
 — *meistostylus*, 217
 — *melanospermus*, 225
 — *Michelianus pygmaeus*, 219
 — *monocephalus*, 225
 — *montis-sellae*, 218
 — *nervulosus*, 221
 — *novae-hannoverae*, 226
 — *ornans*, 221
 — — *stenophyllus*, 221
 — *pedunculosus*, 218
 — — *atrocastaneus*, 218
 — — *floribundus*, 218
 — *pennatus*, 222
 — *platystylis*, 215
 — *polystachyos*, 220
 — *pubisquama*, 215
 — *pumilus nervulosus*, 221
 — *pygmaeus*, 219
 — *racemosus*, 214
 — *stenophyllus*, 221
 — — *ornans*, 221
 — *stoloniferus*, 213
 — *strigosus capitatus*, 412
 — *stuppeus*, 222
 — *sulc'nux*, 220
 — *umbellatus*, 224
 — *Zollingeri*, 214
Cystopteris fragilis, 310, 314
 Cytogenetics of Generic Hybrids of Sorbus, The, 137
Dacrydium falciforme, 141, 142
 — *taxoides*, 141, 142
Dennstaedtia adiantoides, 314
 — *cicutaria*, 314
 — *dissecta*, 314
 — *exaltata*, 314
 — *ordinata*, 314
 — *rubiginosa*, 310, 314
Deschampsia flexuosa, 412
Desmella Aneimiae, 310
Desmodium Dillenii, 416
 Desvieux's Journal de Botanique, Notes on the Dates of Issue of, 247
Dioscorea linearis, 118
 — *nipensis*, 119
Diphylleia sinensis, 443
Diplazium crenulatum, 314
 — *expansum*, 314
Doronicum Pardalianches, 418
Drosera indica, 420
 — *petiolaris*, 420
 — *spathulata*, 420
Dryopteris boqueronensis, 314
 — *Clarkei*, 310
 — *concinna*, 315
 — *dentata*, 310, 315
 — *diplazioides*, 315
 — *effusa*, 315
 — *equestris*, 315
 — *firma*, 315
 — *heteroclita*, 315
 — *melanochlaena*, 315
 — *mollis*, 310
 — *navarrensis*, 315
 — *Nockiana*, 315
 — *oligocarpa*, 310, 315
 — *oligophylla*, 315
 — *opposita*, 315
 — *paleacea*, 315
 — *patens*, 310, 315
 — *patula Rossii*, 315
 — *pilosula*, 315
 — *Poiteana*, 310
 — — *prolifera*, 310
 — *quadripinnata*, 311
 — *resinifera*, 315
 — *rubigena*, 315
 — *rudis*, 315
 — *Sloanii*, 315
 — *Sprengelii*, 316
 — *tetragona*, 311, 316
 — — *guadalupensis*, 311
Elaeagnus umbellata, 416
Elaphoglossum latifolium, 311
 — *lingua*, 316
 — *Pringlei*, 316
Eleocharis capitata, 412
 — *dulcis*, 227
 — *fistulosa*, 226
 — *laxiflora*, 227
 — *ovata*, 412
 — *pellucida*, 227
 — *plantaginea*, 227
 — *spiralis*, 227
 — *variegata laxiflora*, 227

- Eleusine indica*, 412
 Endlicher's "Genera Plantarum," "Iconographia Generum Plantarum" and "Atakta Botanika," 424
Eragrostis Frankii, 411
 — *pilosa*, 411
Erigeron pulchellus, 418
Eriolaena spectabilis, 330
 — *sp.*, 330
Eschscholtzia californica, 414
Eugenia moaensis, 122
 — *Sturrockii*, 124
Euonymus Fortunei kewensis, 445
 — *radicans kewensis*, 445
Euphorbia maculata, 416
 — *Preslii*, 416
 — *supina*, 416
 — *virgata*, 416
Eurya lasiopetala, 54
Evonymus kewensis, 445
 FAULL, J. H. Tropical Fern Hosts of Rust Fungi, 309
Festuca elatior arundinacea, 411
 — *rubra prolifera*, 411
 Fijian Acmpyle, A, 141
Fimbristylis barbata, 228
Fraxinus pennsylvanica lanceolata, 416
Fuirena umbellata, 228
 Fungi, Tropical Fern Hosts of Rust, 309
Galium Aparine Vaillantii, 417
 — *Mollugo*, 417
 — *palustre*, 417
 GLEASON, H. A. & A. C. SMITH. Two New Flowering Plants from St. Lucia, 333
Glyceria pallida Fernaldii, 412
Gonyanera, 278
Gordonia acuminata, 73
 — *reticulata*, 75
 — *semiserrata*, 437
Gratiola neglecta, 417
 — *virginiana*, 417
 GRAY, NETTA E. & JOHN T. BUCHHOLZ. A Fijian Acmpyle, 141
Gumsia chloroxylon, 330
 — *tiliacea*, 330
Haemocharis camellioides, 437
 — *praemorsa*, 437
 — *semiserrata*, 437
Haemodorum coccineum, 420
Haenkeia, 1
Helenium autumnale, 418
Helianthus doronicoides, 418
 — *petiolaris*, 418
Helicteres viscidula, 330
Helmholtzia novoguineensis, 419
Hemionitis palmata, 316
Hicoria sect. *Apocarya*, 254
 — sect. *Apohicoria*, 254
 — subgen. *Drimocarya*, 254
 — subgen. *Pacania*, 254
 HOWARD, RICHARD A. Notes on Some Plants of Cuba, 117
 HSUE, HSIANG-HAO & WOON-YOUNG CHUN. Notes on Chinese Sterculiaceae, 328
Hyalopora Cheilanthis, 311
 — *obovata*, 311
 — *Polytaenii*, 310
Hypaelytrum microcephalum, 228
Hypolytrum compactum, 207
 — *latifolium*, 207
 — *macrocephalum*, 212
 — *pandanophyllum*, 208
 — *parvibractea*, 209
 — *parvibracteatum*, 209
 — *quadriglumatum*, 209
 — *quadriglumatum*, 209
 — *scabrum*, 207
Ipomaea purpurea, 417
Iris Pseudacorus pallida, 413
Isolepis barbata, 228
 JOHNSTON, IVAN M. *Astragalus* in Argentina, Bolivia and Chile, 336
Juncus dichotomus platyphyllus, 413
 — *tenuis anthelatus*, 413
Juniperus sabina Sanderi, 253
 — *Ungeri*, 253
 — *Sanderi*, 253
Kajewskiella, a New Rubiaceae Genus from the Solomon Islands, 331
Kajewskiella, 331
 — *trichantha*, 331
Kieseria cubensis, 125
 KOBUSKI, CLARENCE E. Studies in the Theaceae, XV. A Review of the Genus *Adinandra*, 1
 — Studies in the Theaceae, XVI. Bibliographical Notes on the Genus *Laplacea*, 435
Kyllinga brevifolia, 225
 — *stellulata*, 225
 — *melanosperma*, 225
 — *monocephala*, 226
 — *mindorensis*, 226
 — *subtriceps*, 226
 Lactiferous Plant in South China, A New, 245
Laplacea, Studies in the Theaceae, XVI. Bibliographical Notes on the Genus, 435
Laplacea camellioides, 437

- Laplacea fruticosa*, 437
 — *inaequalilatera*, 437
 — *inaequilatera*, 437
 — *praemorsa*, 437
 — *semiserrata*, 437
Lasiagathis humilis, 200
Lemna minor, 413
Lepironia articulata, 213
 — *bancana*, 208
 — *cuspidata*, 211
 — *macrocephala*, 212
 — *mucronata*, 213
Lespedeza capitata, 416
 — \times *hirta*, 416
 LI, HUI-LIN. Notes on the Asiatic Flora, 442
 — Relationship and Taxonomy of the Genus *Brandisia*, 127
Liatris spicata, 417
Licania oligantha, 333
Ligustrum sect. *Baccatae*, 255
 — sect. *Euligustrum*, 255
 — *acuminatum macrocarpum*, 257
 — *californica aureum*, 256
 — *robustum variegatum*, 256
 — *ciliatum macrocarpum*, 257
 — *elegantissimum*, 256
 — *Ibota aureum Vicarii*, 256
 — *Vicaryi*, 256
 — *japonicum tricolor*, 256
 — *lodense*, 255
 — *macrocarpum*, 257
 — *medium*, 257
 — *nanum compactum*, 255
 — *ovalifolium aureo-marginatum*, 256
 — *aureum*, 256
 — *aureum*, 256
 — *robustum aureo-marginatum*, 256
 — *variegatum*, 256
 — *variegatum*, 256
 — *Tschonoskii macrocarpum*, 257
 — *Vacaryi*, 256
 — *vulgare nanum*, 255
 — *nanum*, 255
Lindleya fruticosa, 437
 — *semiserrata*, 437
Lipocarpha argentea, 229
 — *microcephala*, 228
 — *senegalensis*, 229
Lithocarpus brachystachya, 230
 — *Chifui*, 320
 — *chrysocoma*, 321
 — *cyrtocarpa*, 231
 — *dictyoneura*, 231
 — *Elmerrillii*, 232
 — *Garrettiana*, 234
 — *Lithocarpus Haipinii*, 233
 — *Howii*, 234
 — *iteaphylloides*, 236
 — *obovatilimba*, 236
 — *Paihengii*, 322
 — *Paviei*, 232
 — *podocarpa*, 237
 — *silvicularum*, 232
 — *tremula*, 238
 — *vestita*, 238
Lithospermum arvense, 417
Lonicera cerviculata, 441
Lycium halimifolium, 417
Lycopus virginicus, 417
Lygodium heterodoxum, 313
 — *micans*, 311
 — *polymorphum*, 311
 — *volubile*, 311
Malus micromalus, 415
 — *purpurea pendula*, 254
Mapania subgen. *Cephaloscirpus*, 212
 — subgen. *Pandanoscirpus*, 210
 — *Archboldii*, 211
 — *baccifera*, 211
 — *cuspidata*, 211
 — *dictyophlebia*, 211
 — *Ledermannii*, 212
 — *macrocephala*, 212
 — *montana*, 209
 — *Moseleyi*, 212
 — *pandanophyllum*, 208
 — *papuana*, 210
 — *petiolata*, 211
Mariscus Sieberianus, 224
Matricaria matricarioides, 418
Medicago sativa, 415
Menispermum canadense, 414
Mentha piperita, 417
 MERRILL, E. D. Notes on the Dates of Issue of Desvaux's *Journal de Botanique*, 247
 — On the Identity of *Brandisia Souliei Bonati*, 251
 — & L. M. PERRY. *Kajewskiella*, a New Rubiaceus Genus from the Solomon Islands, 331
 — & N. Y. SANDWICH. On the Identity of the Genera *Cupulissa* Raf. and *Platolaria* Raf., 430
Miconia luciana, 334
Microlaena spectabilis, 330
Milesia andina, 310
 — *arisanensis*, 311
 — *australis*, 310
 — *carpatica erythrosora*, 311
 — *columbiensis*, 311

- Milesia Coniogrammes*, 310
 — *consimilis*, 310
 — *Cryptogrammes*, 311
 — *Dennstaedtia*, 310
 — *Hashiokai*, 311
 — *insularis*, 311
 — *Miyabei*, 310
 — *nervisequa*, 311
 — *philippinensis*, 311
 — *tenuis*, 311
Milesia arisanense, 311
 — *Coniogrammes*, 310
 — *Cryptogrammes*, 311
 — *erythrosora*, 311
 — *Hashiokai*, 311
 — *Lygodii*, 311
Mimulus ringens, 417
Monochoria hastata, 419
 Monograph of the Genus *Acranthera* Arn.
 ex Meisn. (Rubiaceae), A, 261
 Monograph of the Genus *Pomazota* Rid-
 ley (Rubiaceae), A, 186
 Monograph of the Genus *Streblosa* Kor-
 thals (Rubiaceae), A, 145
Morus alba, 413
 — *Brunoniana*, 427
 — *pendulina*, 427
Muscari botryoides, 413
Neobrcea Howardii, 125
Neosepicaea viticoides, 423
Nephrolepis cordifolia, 311
 — *pendula*, 311
 — *rivularis*, 311
 New and Noteworthy Chinese Fagaceae,
 230
 New Guinea and a Proposed New Sec-
 tion of the Genus, Notes on Two
 Species of *Araucaria* in, 259
 New Guinea by L. J. Brass, I, The
 Cyperaceae Collected in, 99
 New Guinea by L. J. Brass, II, The
 Cyperaceae Collected in, 207
 New Guinean Species, Notes on a Num-
 ber of, 419
 New Lactiferous Plant in South China,
 A, 245
 New Plants from Northeastern Sonora,
 Mexico and Notes on Extension of
 Range, 439
 Notes on a Number of New Guinean
 Species, 419
 Notes on Chinese Sterculiaceae, 328
 Notes on Some Cultivated Trees and
 Shrubs, V, VI, 253, 445
 Notes on Some Plants of Cuba, 117
 Notes on the Asiatic Flora, 442
 Notes on the Dates of Issue of Desvaux's
 Journal de Botanique, 247
 Notes on Two Species of *Araucaria* in
 New Guinea and a Proposed New Sec-
 tion of the Genus, 259
Odontosoria Jenmanii, 316
Oenothera laciniata, 416
 On the Identity of *Brandisia Souliei*
 Bonati, 251
 On the Identity of the Genera *Cupu-*
lissa Raf. and *Platolaria* Raf., 430
Onychium japonicum, 311
Ostrya virginiana, 439
Oxalis corniculata, 416
 PALMER, ERNEST J. Second Supplement
 to the Spontaneous Flora of the Arnold
 Arboretum, 410
Panicum agrostoides, 412
 — *clandestinum*, 412
 — *dichotomiflorum*, 412
Papuodendron lepidotum, 422
Parabarium Huaitingii, 245
Paramapania amboinensis, 209
 — *attenuata*, 210
 — *montana*, 209
 — *parvibractea*, 209
 — *simplex*, 209
Pasania cyrtocarpa, 231
 — *Garrettiana*, 234
 — *Paviei*, 232
 — *vestita*, 238
Pellaea cardiomorpha, 311, 316
 — *hastata*, 311
 — *ternifolia*, 311
 — *viridis*, 311
Pentstemon campanulatus subglandulo-
sus, 440
 PERRY, L. M. & E. D. MERRILL. *Kajew-*
skiella, a New Rubiaceae Genus from
 the Solomon Islands, 331
Phaca acutidens, 348
 — *amoena*, 408
 — *andicola*, 370
 — *aracana*, 346
 — *Arnottiana*, 357
 — *atacamensis*, 352
 — *Berteriana*, 350
 — *brachyptera*, 376
 — *brachytropis*, 349
 — *Bustillosi*, 356
 — *canescens*, 350
 — *carinata*, 370
 — *carrizalensis*, 352
 — *Chamissonis*, 346
 — *chilensis*, 346
 — *chrysantha*, 347

- Phaca clandestina*, 365
 — *compacta*, 404
 — *concinna*, 381
 — *coquimbensis*, 352
 — *Cruckshanksii*, 361
 — *cryptantha*, 365
 — *curvicaulis*, 352
 — *depauperata*, 396
 — *diminutiva*, 407
 — *dissitiflora*, 351
 — *dolichostachya*, 351
 — *Domeykoana*, 388
 — *Edmonstonei*, 348
 — *elata*, 352
 — *elongata*, 381
 — *flava*, 347
 — *grata*, 381
 — *inflata*, 353
 — *Landbecki*, 361
 — *laxiflora*, 351
 — *macrocarpa*, 353
 — *macrophyssa*, 355
 — *nana*, 358
 — *nubigena*, 356
 — *ochroleuca*, 345
 — *oligantha*, 387
 — *oreophila*, 358
 — *orites*, 388
 — *palenae*, 358
 — *pa'agonica*, 363
 — *Pissisi*, 347
 — *podocarpa*, 348
 — *pulchella*, 366
 — *quindecimjuga*, 409
 — *Rahmeri*, 358
 — *Reedi*, 357
 — *robusta*, 355
 — *San Romani*, 354
 — *saxifraga*, 396
 — *striata*, 353
 — *tricolor*, 376
 — *triflora*, 391
 — *uspallatensis*, 357
 — *vaga*, 354
 — *verticillata*, 349
Phacelia heterophylla sonorensis, 440
Phillyrea latifolia media pendula, 445
 — *media pendula*, 445
 — *pendula*, 445
Philydrum lanuginosum, 420
Phyllanthus chryseus, 121
Physostegia virginiana, 417
Pityrogramma calomelanos, 311
 — *sulphurea*, 316
Platolaria, 432
Platolaria Raf., On the Identity of the
 Genera *Cupulissa* Raf. and, 430
Platygyne volubilis, 120
Poa nemoralis, 411
 — *trivialis*, 411
Podostemon queenslandicus, 421
Polybotrya osmundacea, 316
Polygonum aviculare angustissimum, 414
 — *arenastrum*, 414
 — *Bistorta*, 414
 — *caespitosum longisetum*, 414
Polypodium arisanense, 311
 — *aureum*, 316
 — *ellipsoideum*, 316
 — *fissidens*, 316
 — *loriceum*, 316
 — *Martensii*, 316
 — *plesiosorum*, 316
 — *Veitchii glaucopsis*, 316
Polyspora axillaris, 73
Polystichum amabile, 311
 — *rachichlaena*, 316
Pomazota Ridley (Rubiaceae), A Monograph of the Genus, 186
Pomazota, 195
 — ser. *Monopodiales*, 201
 — ser. *Sympodiales*, 196
 — *assimilis*, 194, 198
 — *batuensis*, 195, 203
 — *capitata*, 194, 199
 — *involutrata*, 201
 — *pilosa*, 194, 200
 — *reptans*, 194, 196
 — *rivularis*, 194, 201
 — *scabiosiflora*, 195, 202
 — *simalurensis*, 194, 197
 — *sylvestris*, 194, 199
 — *Vanleeuweni*, 194, 197
Pontederia hastata, 419
Populus monticola, 439
Potentilla intermedia, 415
Privet Lodense, 255
Prunella vulgaris lanceolata, 417
Prunus pennsylvanica, 415
Pseudomorus Brunoniana, 428
 — *australiana*, 428
 — *obtusata*, 428
 — *pendulina*, 427
 — *castanaeaeifolia scabra*, 427
 — *sandwicensis*, 428
 — *pendulina*, 427
 — *australiana*, 427
 — *obtusata*, 428
 — *pendulina*, 427
 — *sandwicensis*, 428
 — *sandwicensis*, 428
Psidium confertum, 123

- Psilobium*, 278
 — *siamense*, 281
Psychotria singalensis, 176
 — spec., 150
 — *tortilis*, 162, 164
Pteridium aquilinum, 312
 — — *decompositum*, 312
 — — *Wightianum*, 312
Pteris longifolia, 316
 — *quadriaurita*, 316
Pterygiella nigrescens, 136
Puccinia Lygodii, 311
Pyrus communis, 139
 — *purpurea pendula*, 254
Quercus bella, 326
 — *conduplicans*, 239
 — *cyrtocarpa*, 231
 — *delicatula*, 324
 — *disciformis*, 324
 — *dispar*, 323
 — *Garrettiana*, 234
 — *gracilentia*, 240
 — *nemoralis*, 241
 — *Paohanii*, 325
 — *patelliformis*, 241
 — *phanera*, 242
 — *Sinii*, 243
Rajania linearis, 118
 — *nipensis*, 117
 — *tenella*, 119
Reevesia formosana, 330
 — *lofouensis*, 329
 — *taiwanensis*, 330
 REHDER, ALFRED. Notes on Some Cultivated Trees and Shrubs, V, VI, 253, 445
 Relationship and Taxonomy of the Genus *Brandisia*, 127
Restio articulatus, 213
Retinispora Sanderi, 253
 Review of the Genus *Adinandra*, Studies in the Theaceae, XV, A, 1
Rhododendron macrophyllum album, 254
 — *viscosum*, 416
Ribes rubrum, 415
Rosa suffulta, 415
Rubus alius, 415
 — *frondosus*, 415
 — *idaeus canadensis*, 415
 — *laciniatus*, 415
 — *multiformis*, 415
 — *novanglicus*, 415
 — *permixtus*, 415
 — *philadelphicus*, 415
 — *rhodinsulanus*, 415
 — *Rosa*, 415
Rubus semisetosus, 415
Rumex triangulivalvis, 413
 Rust Fungi, Tropical Fern Hosts of, 309
 St. Lucia, Two New Flowering Plants from, 333
Salix discolor eriocephala, 413
 SANDWICH, N. Y. & E. D. MERRILL. On the Identity of the Genera *Cupulissa* Raf. and *Platolaria* Raf., 430
Sarcopteryx coriacea, 422
Sarosanthra, 3
 — *excelsa*, 62
 — *lasiopectala*, 54
 SAX, HALLY J. & KARL SAX. The Cytogenetics of Generic Hybrids of *Sorbus*, 137
 SAX, KARL & HALLY J. SAX. The Cytogenetics of Generic Hybrids of *Sorbus*, 137
Schima Wallichii, 89
Scirpus atrovirens georgianus, 412
 — *cyperoides*, 224
 — *expansus*, 412
 — *laxiflorus*, 227
 — *planifolius*, 412
 — *senegalensis*, 229
 — *spiralis*, 227
Scrophularia birmanica, 442
 Second Supplement to the Spontaneous Flora of the Arnold Arboretum, 410
Setaria Faberii, 412
Siderobombyx Brem. Nov. Gen. *Rubiacearum Hedyotidearum*, 204
Siderobombyx, 204
 — *kinabaluensis*, 205
Sideroxylon stenosepala, 33
Silene Armeria, 414
 SMITH, A. C. & H. A. GLEASON. Two New Flowering Plants from St. Lucia, 333
Solanum carolinense, 417
Solidago altissima, 418
 — *bicolor lutea*, 418
 — *canadensis* × *junceae*, 418
 — — × *rugosa*, 418
 — *gigantea leiophylla*, 418
 — *junceae* × *puberula*, 418
 — *serotina*, 418
 Solomon Islands, *Kajewskiella*, a New Rubiaceous Genus from the, 331
Sorbaronia alpina, 137, 138
 — *Arsenii*, 137
 — *Dippelii*, 137, 138
 — *fallax*, 137
 — *heterophylla*, 137
 — *hybrida*, 137

- Sorbaronia Jackii*, 137
Sorbopyrus auricularis, 139
 — *bulbiformis*, 139
Sorbus, The Cytogenetics of Generic Hybrids of, 137
Sorbus alnifolia, 137, 138
 — *americana*, 137, 415
 — *Aria*, 138, 139
 — *hybrida*, 139
 — *scopolina*, 138
 — *sp.*, 139
Spartina pectinata, 412
Species Novae Fagacearum Sinicarum, 320
Spiraea japonica, 415
 Spontaneous Flora of the Arnold Arboretum, Second Supplement to the, 410
Stackhousia intermedia, 422
 STEARN, WILLIAM T. Endlicher's "Genera Plantarum," "Iconographia Generum Plantarum" and "Atakta Botanika," 424
Sterculia Henryi cuneata, 329
 — *micrantha*, 328
 — *subracemosa*, 328
Sterculiaceae, Notes on Chinese, 328
Streblosa Korthals (Rubiaceae), A Monograph of the Genus, 145
Streblosa, 150
 — *ser. Costatae*, 161, 177
 — *ser. Ecostatae*, 161, 182
 — *subgen. Eu-streblosa*, 159, 162
 — *subgen. Para-streblosa*, 161, 177
 — *anambasica*, 160, 173
 — *assimilis*, 161, 181
 — *axilliflora*, 162, 183
 — *angustifolia*, 162, 184
 — *latifolia*, 162, 184
 — *laxiflora*, 162, 184
 — *bracteata*, 160, 166
 — *bracteolata*, 160, 172
 — *bullata*, 160, 171
 — *chlamydanthia*, 161, 177
 — *deliensis*, 160, 173
 — *glabra*, 161, 180
 — *glabra*, 183
 — *hirta*, 174, 176
 — *hypomalaca*, 161, 174
 — *Johannis-Winkleri*, 160, 169
 — *lampongensis*, 160, 165
 — *lanceolata*, 161, 179
 — *leiophylla*, 161, 175
 — *longiscapa*, 161, 178
 — *maxima*, 160, 168
 — *microcarpa*, 160, 164
 — *microcarpa*, 175
Streblosa multiglandulosa, 160, 168
 — *myriocarpa*, 160, 167
 — *palawanensis*, 161, 182
 — *Elmeri*, 162, 183
 — *Merrillii*, 162, 183
 — *platyphylla*, 180
 — *polyantha*, 161, 176
 — *puberula*, 164
 — *scabridula*, 161, 176
 — *tortilis*, 160, 162,
 — *undulata*, 160, 170
 — *urticina*, 161, 179
 — *glabrescens*, 161, 180
 — *Stapfii*, 161, 180
 — *urticina*, 181
 — *Wallichii*, 164
Streblus Brunonianus, 427
 — *pendulina*, 427
 Studies in the Theaceae, XV. A Review of the Genus *Adinandra*, 1
 Studies in the Theaceae, XVI. Bibliographical Notes on the Genus *Laplacea*, 435
Styrax agrestis, 423
 Supplement to the Spontaneous Flora of the Arnold Arboretum, Second, 410
Sutherlandia Darumbium, 354
Symplocarpus foetidus, 413
Symplocos confusa, 423
Tectaria irregularis, 316
Ternstroemia bancana, 93
 — *coriacea*, 73
 — *crenulata*, 92
 — *epiphytica*, 46
 — *insignis*, 33
 — *integerrima*, 69, 75
 — *reticulata*, 75
 — *sericea*, 89
 — *urdanetensis*, 46
Thoracostachyum bancanum, 208
 — *hypolytroides*, 208
 — *montanum*, 209
 — *pandanophyllum*, 208
 — *parvibractea*, 209
 — *simplex*, 209
 — *subcapitatum*, 208
Torrenticola queenslandica, 421
Torulinum ferax, 226
Tragacantha andina, 356
 — *arequibensis minima*, 390
 — *tenuifoliola*, 390
 — *atacamensis*, 396
 — *bella*, 367
 — *bisinflata*, 353
 — *brevialata*, 376
 — *Cruckshanksii glabrescens*, 362

- Tragacantha firma*, 355
 — *Gayana*, 408
 — *grandis*, 353
 — *longior*, 382
 — *Philippiana*, 408
 — *procumbens glabrescens*, 388
 — *Weddelliana*, 395
Tricera flaviramea, 126
Triglochin procera, 419
 Tropical Fern Hosts of Rust Fungi, 309
 TSIANG, YING & WOON-YOUNG CHUN.
 A New Lactiferous Plant in South
 China, 245
 — & — Species Novae Fagacearum Sini-
 carum, 320
 Two New Flowering Plants from St.
 Lucia, 333
Uragoga, 150
Uredinopsis aspera, 312
 — *glabra*, 310, 311
 — *Hashiokai*, 312
 — *investita*, 310
 — *macrosperma*, 312
 — *Mayoriana*, 310
Uredo blechnicola, 310
 VAN STEENIS, C. G. G. J. Notes on a
 Number of New Guinean Species, 419
Veronica arvensis, 417
Viburnum alnifolium praecox, 446
 — *cassinoides*, 417
 — *dentatum*, 417
 — *lantanoides praecox*, 445
 — — *praecox*, 445
 — *Opulus*, 417
 — *plicatum tomentosum*, 445
Viburnum recognitum, 417
Viola aberrans, 416
 — *abundans*, 416
 — *blanda*, 416
 — *fimbriatula* × *papilionacea*, 416
 — — × *sagittata*, 416
 — — × *scabriuscula*, 416
 — *lanceolata* × *sagittata*, 416
Vitex chinensis, 258
 — *incisa*, 258
 — — *heterophylla*, 258
 — — *multifida*, 258
 — *laciniatus*, 258
 — *Negundo*, 258
 — *Negundo heterophylla*, 258
 — — — *multifida*, 258
 — — — *incisa*, 258
 — — — *multifida*, 258
Vitis aestivalis, 416
 — *riparia*, 416
 — *vulpina*, 416
Wallichia spectabilis, 330
 WHITE, C. T. Notes on Two Species of
 Araucaria in New Guinea and a Pro-
 posed New Section of the Genus, 259
 WHITE, STEPHEN S. New Plants from
 Northeastern Sonora, Mexico and Notes
 on Extensions of Range, 439
Wikstroemia fruticosa, 437
Woodsia mollis, 316
Xanthium pennsylvanicum, 418
Xerotidae sp., 419
Xyris Jupicai, 126
Zanthoxylum americanum, 416

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CONTENTS OF NO. 4

ASTRAGALUS IN ARGENTINA, BOLIVIA AND CHILE (<i>Concluded</i>). By <i>Ivan M. Johnston</i>	375
SECOND SUPPLEMENT TO THE SPONTANEOUS FLORA OF THE ARNOLD ARBORETUM. By <i>Ernest J. Palmer</i>	410
NOTES ON A NUMBER OF NEW GUINEAN SPECIES. By <i>C. G. G. J. van Steenis</i> ..	419
ENDLICHER'S "GENERA PLANTARUM," "ICONOGRAPHIA GENERUM PLANTARUM" AND "ATAKTA BOTANIKA." By <i>William T. Stearn</i>	424
ON THE IDENTITY OF THE GENERA CUPULISSA RAF. AND PLATOLARIA RAF. By <i>E. D. Merrill</i> and <i>N. Y. Sandwith</i>	430
STUDIES IN THE THEACEAE, XVI. BIBLIOGRAPHICAL NOTES ON THE GENUS LAPLACEA. By <i>Clarence E. Kobuski</i>	435
NEW PLANTS FROM NORTHEASTERN SONORA, MEXICO AND NOTES ON EXTENSIONS OF RANGE. By <i>Stephen S. White</i>	439
NOTES ON THE ASIATIC FLORA. By <i>Hui-Lin Li</i>	442
NOTES ON SOME CULTIVATED TREES AND SHRUBS, VI. By <i>Alfred Rehder</i> ..	445
THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1947 ..	447
BIBLIOGRAPHY OF THE PUBLISHED WRITINGS OF THE STAFF AND STUDENTS, JULY 1, 1946-JUNE 30, 1947	450
STAFF OF THE ARNOLD ARBORETUM, 1946-47	453
INDEX	455
TITLE-PAGE AND TABLE OF CONTENTS	i-iv

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